THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XVI. No. 388—19th YEAR.] LONDON, SEPTEMBER 3, 1867. [Subscription per Ann. 15s. in Advance 18s. Credit.] TREBLE No. 1s. 4d. Unstamped.

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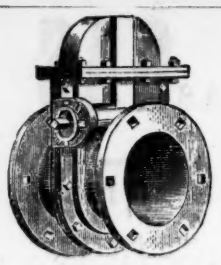

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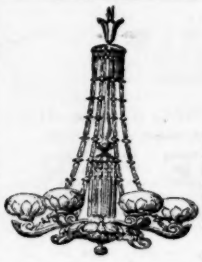

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1¼ ,,	0 11 0
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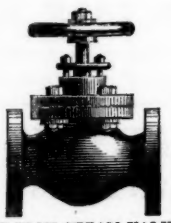
2 ,,	1 2 6



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NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

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Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 3, 1867.

Notes upon Passing Events.

Not less than four measures for improving the condition of the labouring classes have arrived at the full stage of Acts of Parliament in a session which is generally considered to have been singularly barren in practical legislation. The first is an attempt—not made before wanted—to check a great and increasing abuse in the employment of agricultural labour. Agricultural gangs are a modern invention for disciplining and getting the most out of the labour of children. They began in Norfolk, and promised to spread over every thickly-populated county. The Act for the regulation of agricultural gangs will do something towards encouraging order, decency, and education. It comes into operation in January, 1868. The regulations are few and simple. No child under the age of eight years is to be employed in any agricultural gang. No females can be employed in the same agricultural gang with males. No females can be employed in any gang under any male gangmaster, unless a female licensed to act as gangmistress is also present with that gang. Every gangmaster must have a licence. No publican or beershop-keeper can be licensed as a gangmaster. The justices in petty session, in whom the power of granting licences is lodged, may limit the distance within which the children employed by gangmasters are to be allowed to travel on foot. The regulations of the Act are enforced by penalties and withdrawal of licence for periods of three months or two years, and after a fourth conviction the gangmaster will be permanently disqualified from holding a licence. All this is not much, but it is enough as a beginning. Labour decently carried on and not excessive in quantity is not an infliction, but a boon to the children of agricultural servants. This Act will, in effect, make employers responsible for the gangmasters they employ.

The next Act to which we shall call attention is one for extending the application of Factory Acts to factories not hitherto included in them. The following are the leading restrictions:—No child, young person, or woman, shall be employed on Sunday in any factory (or metal manufacture). No boy under twelve years of age and no female shall be employed in melting or annealing glass. No child under eleven years of age shall be employed in grinding in the metal trades. In the manufacture of glass, no man under eighteen years of age and no woman shall be allowed to take meals where materials are mixed, or where grinding, cutting, and polishing flint glass is carried on. Inspectors have the power to enforce the use of a fan wherever "inhalation of grinding dust could be prevented by its use." Inspectors may order any grindstone that seems dangerous to be refixed. The schedule to this Act, in addition to the temporary modifications, contains certain permanent modifications of the regulations now applied to almost all manufactories where any considerable number of persons are employed. Thus, under certain circumstances, the Secretary of State may authorize the employment of young male persons of not less than sixteen years of age for a period not exceeding fifteen hours in one day—such order to be advertised in the *Gazette*—but only provided due proof has been given that it is required by the exigency of the trade, and that such occasional employment is not injurious to the health of such male persons; that they are not employed except between six in the morning and nine in the evening; that they shall be allowed half an hour for a meal after the hour of five in the evening; that they are not so employed for more than twelve days in any period of four weeks, nor on the whole for more than seventy-two days in twelve months. With certain exceptions, it will not be lawful to employ children, young persons, or women, after two o'clock in the afternoon of Saturday. In letter-press printing, young male persons of the age of sixteen years may be employed for a period not exceeding fifteen hours in one day, provided that they shall not be so employed except between the hours of six in the morning and nine in the evening, or in any office where permission has been given by the Secretary of State to work (at other hours). In addition to the time allowed under the Factory Acts for meals, they shall be allowed half an hour for a meal after six in the evening; they shall not be so employed except on alternate days; they shall be allowed one whole or two half holidays in every week of such extra labour. Similar modifications and provisions are made for bookbinders. In blast furnaces, where young persons are employed at night, they are not to be worked by day. In paper mills the hours of work for young male persons are not to exceed sixty hours in any one week, between midnight on Sunday night and midnight on the succeeding Saturday night. The hours of attendance are not to exceed fourteen hours in twenty-four. The provision of the Factory Acts for giving eight half holidays every year in addition to Christmas Day and Good Friday is extended to the new trades. How this Act will work remains to be seen. About the necessity of legislation for the protection of children, women, and minors, evidence carefully taken left no doubt; whether Parliament, in its more than paternal care, has regulated too much, we shall soon learn. Glass and iron manufacturers, at any rate, will have to remodel their arrangements for juvenile assistance.

Next, bearing on the same subject, is an "Act for Regulating "the Hours of Labour for Children, Young Persons, and "Women employed in Workshops," as distinguished from factories. Under this Act no child under eight years of age can be employed in any handicraft. No child can be worked more than six and a half hours; these hours to be between

six in the morning and eight at night. The other regulations, limiting the labour of young persons under eighteen, and women, are based on the Factory Act. Sunday work is made illegal, and a Saturday half holiday compulsory. No child under eleven is to be employed in the dusty trades of metal grinding, or in cutting fustian. Every child employed in a workshop must attend school for at least ten hours in every week. Breach of any of these regulations is punishable by fine on the parent and on the employer. Thus the education clause is an approach to compulsory education, for "the parents of every "child employed in a workshop shall cause the child to attend "school in manner required by this Act. Every parent who "wilfully fails to act in conformity with this section shall be "liable to a penalty of not more than twenty shillings for each "offence," and there is a penalty on employers not exceeding three pounds. The employer may deduct not more than twopence a week from the child's wages for the principal teacher of the school.

The Masters and Servants Bill places employed and employer on an equality in case of breach of contract on either side, with summary remedy before two justices or one stipendiary magistrate. The Act abolishes imprisonment, except when there is reason to believe the defendant is about to abscond, and except where the party found guilty neglects to pay the sum awarded. The fourth Act gives power to the Secretary of State to license Councils of Conciliation, to be composed of a chairman unconnected with trade, and an equal number of masters and workmen; these Councils to have powers to enforce awards by distress or commitment to prison.

While Parliament has been collectively busy, an influential member of the Upper House has been putting in a good word for a much tormented set of little folks—the Sunday-school scholars—who, under the terror of the squire's lady and the parson in rural parishes, and by the influence of cake and tea and van-excursion bribes in London, are subjected to an immense amount of useless misery. The Bishop of Oxford has been telling the good stupid people who often manage Sunday-schools that children of tender years require a great deal of sleep, and when awake can no more be kept still than so many bees; therefore he calls on the stiff starched *goody* people to make their instruction short, pleasant, and amusing, and to let the children, if they must be kept for long hours—go to sleep! This seems very simple advice—mere truisms—but those who have watched the ill-directed zeal of too many parsons, beadles, and Sunday-school teachers, will heartily thank the Bishop of Oxford for his timely crusade. His reputation and position give his words an unusual degree of weight amongst the Church school-teaching people—excellent people, but often deficient in sympathy for the little imps they want to mend.

It seems from the discussion on trades union business, reported in the *Beehive*, that the leading agitators are not satisfied with a Parliament that has done so much for the working man, but are looking out for some power in the reformed Parliament to counteract the influence of "middle-"class juries." A "middle-class jury" has convicted the picketing tailors, and a "middle-class jury" has acquitted the masters charged with libel for publishing a black-list of unionists. Therefore the middle class are to assume the place in politics once monopolized by that monster the "aristocrat." What is the course of legislation desired? Are the laws of trades unions to become laws of the land, or will the exclusion of middle-class men from juries be sufficient? But then in this war against the middle class the puzzling question will arise, what does a middle-class man mean? "Sir," said the candid coachman in the first French Revolution, "if your coat "is better than mine you are an aristo." It is to be hoped that time, which levels and cures all things, will in the end bring capital and labour together again on amicable terms. At present the tide of trade is turning strongly to those countries where trades unions, if permitted, are under the control of the police. The iron trade is already hardly pressed; the Act for the regulation of juvenile labour will not make production cheaper; the trades union rules and persecutions are beginning to tell a tale: British capitalists are seriously turning their thoughts to France and Belgium. Workmen may yet learn that there is nothing so moveable as money, and nothing so hard to move as labour. To write or to lecture to short-sighted deaf people is useless. Here are the tailors, who have lost the season, as defiant (in print) as ever, and yet the work of the sewing-machine, which has made female labour so much more available, is about to be assisted by a pressing-machine, which will take away the last reason for employing men. Up to the present time women who could work a machine could not iron out the seams—they could not handle the heavy "goose." The strike has forced the invention of a pressing-machine. The gas stokers will be the next victims of Potter and Co. The Irish stonemason, Mr. Conolly, and Mr. Brook, a joint of Mr. Beales's tail, a poulterer who has not yet made a fortune by plucking genuine geese—these are the disinterested friends of the stokers. It is a pity they did not rely on themselves for a statement of their case and a discussion of their claims. When Mr. Potter is called in, it means not a bargain, but war. His interference will encourage the directors to adopt machinery for charging and discharging retorts, which they have too long neglected, but which promises to economize 90 per cent. of stokers labour in large gas-works.

The authorities of South Kensington, of the Society of Arts, Lord Granville, and others of the same school, have lately been writing and repeating a good deal on the want of "technical education" in England; that is, of education in those arts and sciences which can and must be applied in manufactures. The names of some of the witnesses to the comparative decline of British manufacturing pre-eminence are justly looked upon with suspicion by many of the non-official world, but there are others who bring forward facts that cannot be passed over by any man of common sense. We have ourselves heard a Cornish mining engineer—a plain practical man of great reputation and extraordinary experience—speak in terms of the highest admiration of the education of the German miners. He found that by the union of scientific training with practical experience, profits were made in Germany in the extraction of silver from ore which would have been treated as rubbish in this country; and he deplored the indifference shown by the working classes of his country to the advantage of education. Yet no one despised more than this gentleman mere book learning. We have heard him relate that once, when sent out in company with a lecturing professor—who had been glib on the voyage, and very positive too—to examine a Spanish mine, he sat down at the bottom of the shaft and said to his learned brother, "Now, "pray look over the mine and give me your opinion of the "indications." Whereupon the talking professor, to use an expressive American expression, "*caved in.*" Amongst the correspondence on the subject of technical education, are two letters which really carry weight, because the writers know what they are talking about and aim at distinct points. Mr. Mundella, in the course of a long letter, says:—

> The branch of industry with which I have been connected for thirty years past is the manufacture of hosiery. I am the managing partner of a firm employing 5000 workpeople, with establishments in Nottingham, Derby, and Loughborough, employing more than four-fifths of the number, and with branches at Chemnitz and Pausa, in Saxony, employing about 700 persons.
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> In addition to the opportunities and experience which the superintendence of these establishments has afforded me, I have for many years past formed friendships with manufacturers in France and Germany. I have had free access to their warehouses and workshops, and I am as well acquainted with the progress of my own branch of industry in those countries as in England.
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> As the result of my observation, I have for four or five years past been increasingly alarmed for our industrial supremacy; and my experience of the Paris Exhibition has only confirmed and strenthened my fears. In my own branch we still maintain the lead in the majority of articles, but the progress made by France and Germany since 1862 is truly astonishing, and it has been much greater than our own.
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> I am of opinion that Englishmen possess more energy, enterprise, and inventiveness than any other European nation. The best machines in my trade now at work in France and Germany are the inventions of Englishmen, and in most cases of uneducated workmen; but these machines of English invention are constructed and improved by men who have had the advantage of a superior industrial education. The largest hosiery machine-shop in France is that of Monsieur Tailbours, at St. Just. Models of all the best English machines have been purchased and imported, and are there improved and constructed on thoroughly scientific principles, under the superintendence of a young man who, I was informed, took high honours at the school of the Government in Paris.
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> Precisely the same thing is taking place in Saxony, but the Saxons are, in respect of education, both primary and industrial, much in advance of the French, and in my branch they are our most formidable rivals.
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> In Nottingham, where the best machinery in the world is required and used in the production of hosiery and lace, there is no such thing as industrial education, and greatly as it is to be desired, I am acquainted with many good mechanics and superior workmen to whom it would be of no service, inasmuch as they can neither read nor write.
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> The contrast betwixt the workpeople of England and Saxony, engaged in the same industry, is most humiliating. I have had statistics taken of various workshops and rooms in factories in this district, and the frightful ignorance they reveal is disheartening and appalling. I was born and educated amongst the working classes, and all my life have been in close association with them, but I never realized the condition of the *lower masses* of our workpeople till I took the pains to examine them personally in the manner I have indicated.
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> In Saxony, our manager—an Englishman of superior intelligence, and

greatly interested in education—during a residence of seven years has never yet met with a workman who cannot read or write; and not in the limited and imperfect manner in which the majority of English artisans are said to read and write, but with a freedom and familiarity that enables them to enjoy reading and to conduct their correspondence in a creditable and often superior style. Some of the sons of our poorest workmen in Saxony are receiving a technical education at the Polytechnic schools, such as the sons of our manufacturers cannot hope to obtain.

Whilst, therefore, I believe that the English workman is possessed of greater natural capacity than any of his foreign competitors, I am of opinion that he is gradually losing the race through the superior intelligence which foreign governments are carefully developing in their artisans.

The education of Germany is the result of a national organization, which compels every parent to send his children to school, and, after having laid the foundation of a sound education, affords to all those who have the capacity and inclination the opportunity of acquiring such technical knowledge as may be useful in the department of industry for which they are destined.

And Mr. Young says:—

England for a long time excelled all other countries in the finish of her machines; but now we find that foreign machine makers are rapidly approaching us in finish, and, having skilled and intelligent labour cheaper than ourselves, are progressing in all the elements of manufacturing.

Permit me to use my own case as an illustration. Originally I was a working man, but have succeeded in increasing the range of manufacturing industry. The foundation of my success consisted in my having been fortunately attached to the laboratory of the Andersonian University in Glasgow, when I learned chemistry under Graham, and natural philosophy and other subjects under the respective professors. This knowledge gave me the power of improving the chemical manufactures into which I afterwards passed as a servant, and ultimately led to my being the founder of a new branch of industry, and owner of the largest chemical manufacturing works of the kingdom. It would be most ungrateful of me if I did not recognize the importance of scientific and technical education in improving and advancing manufactures. Many men, without such education, have made inventions and improvements, but they have struggled against enormous difficulties, which only a powerful genius could overcome, and they have been sensible of the obstacles to their progress. Stephenson, who so greatly improved locomotives, had to be his own instructor, but he sent his son Robert to Edinburgh University, and the son did works at least as great as the father, and with far less difficulty to himself.

The improvement in locomotion has necessarily created great competition in the industries of the world, and unless we add skilled instruction to manual labour, England cannot expect to maintain her position in the industrial race.

Such evidence as this cannot be treated with indifference. If we want further illustration, we may find it in the gardens of great houses, where the gardeners are so often Scotchmen, because in Scotland education is not only to be had, but is valued by the poorest.

If the Paris Exhibition—which has been, as a whole, a gigantic piece of advertising of French wares—only makes the mass of Englishmen discontented with their manufacturing progress, it will do more for England than any number of medals. No country can equal us in applying what we know, unless it be America. Ludicrous examples of the want of the art of doing as well as knowing constantly occur in Germany. When Berlin was to be supplied with water, it was an English company that had to do the job. In Frankfort, probably any dozen common men or boys gathered in the streets would know ten times as much of the science of hydraulics as the same number picked up in Sheffield or in Birmingham; but, when there was a fire the other day in Frankfort, it spread from a carpenter's shop to the cathedral, because there was not a decent fire-engine in the city. It is not of the slightest consequence to our commerce who gets the prizes at the Paris Exhibition; prizes only help advertising tradesmen. Sheffield travellers will always be able to sell Sheffield wares as long as they are better and cheaper than those of other countries, and no longer. An amusing instance of the nonsense of the prize system is to be found in the report of a Mr. Henry Göschen on the saddlery of the Paris Exhibition. If there is a branch of manufacture in which the superiority of England is undoubted, it is in saddlery; and for obvious reasons—we ride and drive more than any other civilized nation. In quality, in taste, as well as in quantity and cheapness, our pre-eminence is indisputable. The best Paris saddlery is only a good imitation of London and Dublin work; but our best saddlers did not compete in the Paris tournament, and their wisdom is innocently admitted by Mr. Göschen, for he says—"As two "of the jurors were Frenchmen, one a Russian, and one an "Englishman, it is not surprising that the majority of the "medals went to France." But for all that—although we import cabinet work, and clocks, and paperhangings, and silks, and muslins from France—not even a Frenchman living in London will send to Paris for a saddle, a set of harness, or a whip. Mr. Göschen, by-the-by, has one qualification for a reporter: he is quite ignorant of his subject, and, therefore, is quite impartial. He mentions some imitation of White's old patent substitute for harness-buckles as a novelty!

THE DEATH OF FARADAY.

Michael Faraday, one of the greatest philosophers of the present century, has passed away. The whole of Europe will mourn the loss of a man to whom science is indebted for some of its most wonderful discoveries of Nature's laws, and his countrymen especially will lament the loss of one who, by his modest and amiable character, combined with his surpassing talents, added to the glory of England among the nations. He died at Hampton Court, on Sunday, the 25th of August, at the mature age of 73.

Faraday was one of England's brightest examples of the power of intellect to overcome the disadvantages of humble birth and position, and to rise to the highest rank among those whom the world looks up to and admires. His father was a blacksmith, and Michael Faraday was apprenticed, after having received very imperfect scholastic education, to a bookbinder in Blandford Street, in London. But his natural instincts were averse to trade, and in early life he showed the bent of his genius by making for himself a Leyden jar from an apothecary's phial, and by afterwards converting another glass bottle into an electrical machine. With that rude apparatus he commenced his researches into the science of electricity. When eighteen years of age he received a ticket of admission to four lectures on chemistry, delivered by Sir Humphry Davy at the Royal Institution, of which he took careful notes. His attendance at those lectures was the turning-point of his life. He became, in consequence, more and more anxious to devote himself to scientific pursuits, and with that view he sent a copy of his notes first to Sir Joseph Bankes—from whom he did not receive any reply—and afterwards to Sir Humphry Davy, expressing his desire to leave his trade and to become a devotee of science. Sir Humphry replied kindly to his application, and took so much interest in the young man that in the following year (1813) he obtained for him the situation of assistant in the laboratory of the Royal Institution. That was the decisive step in Faraday's career. He had then an opportunity of gaining the kind of knowledge he most desired, by assisting in the experiments of the greatest chemist of the age, conducted with the aid of the best apparatus that could be procured. Sir Humphry Davy became attached to his intelligent assistant, and, when he went abroad in the latter part of 1813, Faraday accompanied him, to act as his scientific assistant and secretary, and remained abroad until 1815. Sir Humphry Davy had soon perceived and appreciated the eminent qualifications of his assistant, and Mr. Davies Gilbert once said to him—"The greatest discovery you ever made, Sir "Humphry, was the discovery of Faraday." It was conjectured, however, that some jealousy was afterwards felt by the great master at the success of his pupil, which was especially excited by his discovery of the means of liquefying chlorine gas. The confirmation of the perfect correlation of magnetism and electricity, by the discovery that electricity is induced by making and breaking contact with a permanent magnet, was perhaps the most important accession to scientific knowledge made by Faraday, and has led to the creation of the science of magneto-electricity, with its numerous practical applications. He brought out, in 1827, his work on "Chemical "Manipulation," and two years afterwards he was appointed chemical lecturer at the Woolwich Academy. In 1831, the first of an important series of papers—"Experimental Re-"searches in Electricity"—was published in the "Philosophical Transactions," which, when completed, formed one of the most philosophical treatises ever written. From that time he appears to have devoted himself almost entirely to the study of electricity and magnetism, on the actions of which he continually threw additional light. He was, however, so extremely modest, and placed so low an estimate on his own acquirements, that, when requested at the meeting of the British Association, at Swansea, to give his opinion on the nature of electricity, respecting which some professing electricians had been very confident, he said—"There was a time "when I thought I knew something about the nature of "electricity, but the longer I live, and the more I study the "subject, the more convinced I become that I know nothing "about it."

Faraday cultivated science for itself, and not for the rewards it might bring; and whilst many whose claims were comparatively utterly insignificant reaped honours and wealth, he remained with small reward. He was appointed Professor of Chemistry at the Royal Institution in 1833; the University of Oxford conferred on him an honorary degree in 1837; he

was granted by the Crown a pension of £300, and in 1857 apartments were assigned to him in Hampton Court, where he died. It is a curious fact that, during the progress of electric telegraphy, he took no part whatever in the practical application of the science which he had studied so deeply, and the only invention with which his name is associated is the ventilating gas-burner patented by his brother. It is about four years since he bade farewell to the audience assembled at one of the Friday evening meetings at the Royal Institution. He then said that his memory failed him so much that he felt himself unable to lecture in public. At that time, however, his physical health seemed unimpaired, and he retained his youthful elasticity of step for two years afterwards. In the session before the last a sad change had taken place, and though he attended the evening lectures he leaned on a stick for support. During the last session he seldom appeared, but when he did he was greeted with a welcome cheer. It has been truly said of him, that "there never was a man more "entirely unselfish or more entirely beloved; modest, truth-"ful, candid, he had the true spirit of a philosopher and of a "Christian."

Circular to Gas Companies.

THE anticipated amendments in the special report of the select committee on the Metropolis Gas Act Amendment Bill were limited to the correction of a single clerical error, respecting which there could have been no misapprehension. The further issue of the long-delayed report was, in fact, suspended for the sole purpose of altering the figure 7 in the notice of the Chartered Company's Bill into the figure 5, which indicated the per centage of dividend allowed to be paid on the amount proposed to be capitalized, the former figure being evidently a misprint. The whole report, as so amended, will be found in another portion of our present number. This very lengthy document may be divided into three parts. The first, which occupies fully one-third, presents a statement of the position of the metropolitan gas companies under the Acts of 1847 and 1860, the resolutions of the committee of last year, and the state of the question of the supply of gas to London as it was brought before Mr. Cardwell's committee. The second part of the report gives a general summary of the proceedings during the 23 days that the inquiry continued; and the third and most important portion contains the opinions and recommendations of the committee, as guides for future legislation. The pervading idea which possessed the minds of the committee seems to have been that the best system of gas supply is that which is conducted by local authorities, and that when the supply is in the hands of companies the interests of the consumers can be best secured by competition. Nevertheless, they could not fail to be struck with the wasteful expenditure occasioned by the construction of unnecessary gas-works, and the multiplication of management; and in various parts of the report the influence of these conflicting opinions appears in inconsistencies which it is difficult to reconcile. The committee considered themselves bound to adhere to the agreement made between the gas companies and the Board of Trade; but it is very evident that they submitted to that arrangement with great reluctance, and while professing great respect for parliamentary guarantees, they endeavoured so to modify them as to render such security almost nugatory. The annoyance which they felt from the restrictions that were placed on them by the Board of Trade is clearly indicated by the recommendation that in any future measure for the regulation of the supply of gas to London, the Board of Trade should abstain from the introduction of any measure for that purpose. The construction attempted to be put on the incorporation into the Metropolis Gas Act of the provision of the General Act of 1847, which recognizes the right of gas companies to divide 10 per cent. among their shareholders, manifests a jesuitical perversion of the plain meaning of the Act to suit their peculiar views. The committee, from some unexplained reason of their own, infer that the Gas-Works Clauses Act of 1847 was passed with a view to competition by other companies; and they observe that when that Act was incorporated with the Metropolis Gas Act of 1860, by which competition was excluded, the gas companies had, in only a few instances, reached the limit of 10 per cent., and that the possibility of that limitation being interpreted to convey a right to a "statutory" dividend of 10 per cent. was not clearly understood. The committee infer that when the Legislature, in 1847, authorized gas companies to divide 10 per cent. on their paid-up capital, they had no idea that such an amount of profits would have been realized, and that the provision allowing the payment of back dividends was never expected to be brought into operation. The plain meaning of that paragraph of the committee's report is this:—That the Legislature of 1847, having conferred on the gas companies nominal privileges under conditions which would render their realization impossible, the metropolitan gas companies surreptitiously introduced into the Act of 1860 the same privileges, not subjected to those conditions; and that, having thus obtained the rights they contend for by a species of fraud, they have no just claim to their possession; and that if by any chicanery, short of spoliation, they can be deprived of their statutory dividends, it would be a fair and equitable proceeding. Stripped of its equivocation and verbiage, that seems to be the plain meaning of the first paragraph of the report, which follows the narration of the proceedings of the committee, and the paragraph concludes very consistently with that signification by expressing the opinion that the companies should not be allowed "to make good the deficiency of "one year's dividend by the surplus of another." It is true that many of the companies to which the General Act of 1847 applied were subjected to competition, but it was to encourage the investment of capital in such useful undertakings that the privilege of dividing back dividends was granted, and it is a foul calumny on the Legislature of that day to assert that they lured capitalists to embark in hazardous enterprises by offering inducements which it was known were fallacious. With regard, however, to the Metropolis Gas Act, the circumstances were so specific that there is no pretence whatever for saying that the arrangement made with the gas companies was not well understood and carefully considered. Some of the metropolitan companies had already attained their maximum dividends, and the parliamentary sanction of the districting arrangements, which secured to the companies a monopoly of their respective districts, was accompanied by a limitation of the period during which back dividends might be paid. According to the terms of compromise then made between the gas companies and the consumers of gas, when the profits of any company amounted to upwards of 10 per cent., the surplus should be appropriated to make up any deficiency during the six preceding years, and the price charged for common gas might be 4s. 6d. per 1000 feet until those dividends were paid. The committee admit, in their report, that the gas companies have more than fulfilled their engagements to the public; that the illuminating power of the gas has exceeded the prescribed standard, that they have reduced the price, and have generally complied with the other provisions of the Act; but it is brought as a charge against them that they have gained greater advantages from its operation than the consumers, and that by more economical management gas might be supplied at a lower price. The committee profess to pay great respect to parliamentary guarantees, and to be unwilling to do anything opposed to the interests of those who purchased shares in gas-works in dependence on such security, yet the recommendations in their report are directly at variance with such professions. The payment of back dividends forms a portion of the parliamentary guarantee quite as much as the maintenance of the prescribed rate of dividends, nevertheless the committee repudiate very strongly all recognition of such a guarantee, utterly regardless of the privilege granted by the Act. In the absence of the consent of the parties to such a renunciation of their legal rights, the committee were bound to respect them; but they appear to have considered that though they could not depart from the conditions of the agreement between the companies and the Board of Trade, so far as to disregard the current rate of 10 per cent. dividend, they might deal as they pleased with the right which the shareholders equally possess to be compensated for deficiencies in former years, and it was by disagreement on that point that the whole inquiry came to nought.

As a guide to future legislation, the report of Mr. Cardwell's committee is more adverse to the gas companies than the report of the committee on the metropolitan gas inquiry of last year. It is evident also that it would have been still more so had the committee not been bound by the agreement between the gas companies and the Board of Trade for the maintenance of the prescribed rate of dividends. The substance of the report, as may be gathered from the various views taken in the course of it, may be thus summed up:—The thirteen gas companies have obtained greater benefits from the Act of 1860

than the consumers, and the latter ought to have a larger share of the advantages to be derived from the absence of competition; that, having regard to existing parliamentary guarantees, the only way of securing for the public such a supply of gas as they ought to possess would be to force concessions from the companies by threatened competition; and that unless they will consent to the terms required, power should be given to the Corporation of London and to the Metropolitan Board of Works to compete with them in supplying gas. The required terms are indicated by the committee in their statement of the advantages that would have been gained had the Bill passed in the form they proposed. They consist of a supply of 16-candle gas for 3s. 9d. per 1000 feet; improved administration and reduced expenditure by the amalgamation of the companies; an efficient audit of the accounts; an effective supervision of the working and expenditure; the abolition of the system of back dividends; the payment of penalties out of the sum divisible among the shareholders; the periodical revision of price through the agency of arbitrators appointed by the Board of Trade; and the ensurance of the purity of the gas by a system of administration under the superintendence of the same Board. To all those conditions the gas companies consented, with the exception of the non-payment of back dividends, to which renunciation of their right they objected as a matter of principle, as it is a right possessed by all gas companies working with parliamentary powers. The pertinacity with which the committee insisted on the abrogation of that provision of the General Act of 1847 put a stop to legislation on the subject of the gas supply of London during the present year, and has postponed the settlement of the question till another session. The realization of the important advantages which they affirm would have attended the adoption of the amendments to which the gas companies assented has thus been delayed, and the wasteful expenditure of another parliamentary contest will have to be incurred.

In the meantime the metropolitan gas companies are endeavouring to make arrangements for carrying into effect the recommendation of the committee that they should amalgamate. The present feeling among them continues to be in favour of an amalgamation into four companies—viz., a Western company, comprising the Chartered, the London, the Equitable, and the Western; a Northern company, consisting of the Imperial and the Independent; an Eastern company, to be formed by the amalgamation of the City of London, the Great Central, the Commercial, and the Ratcliff; and a Southern company, to be formed by the union of the Phœnix, the South Metropolitan, and the Surrey Consumers companies. The following statement of the quantities of gas sold by each company in 1866 shows that the proposed grouping of the companies north of the Thames would approximate to an equalization of the respective districts; but the adoption of such an arrangement would involve the necessity of interchanges not only of districts but of manufacturing stations, none of which would be necessary could an amalgamation of the thirteen companies into one be effected:—

		Cubic Feet.
Western...	Chartered	1,201,228,000
	London	742,663,000
	Equitable	365,653,000
	Western	338,288,000
		2,650,832,000
Northern..	Imperial	2,380,521,000
	Independent	380,496,000
		2,761,017,000
Eastern ...	City of London	527,404,751
	Central	389,443,800
	Commercial	628,364,000
	Ratcliff	145,128,000
		1,690,340,551
Southern ..	Phœnix	839,088,000
	South Metropolitan.	417,908,000
	Surrey	294,332,000
		1,551,328,000

There are mutterings in the local papers of Worcester and Cheltenham which show that the question of public lighting continues to disturb the equanimity of the local authorities of those places, and that attempts are being made to extort unreasonable terms from the gas companies. It was supposed that the liberal concessions made by the gas company at Cheltenham had been quite sufficient to pacify the most querulous of the agitators, but minor questions have arisen which serve to keep discontent alive, and threaten to render nugatory the offers which the gas company were induced to make for the purpose of conciliation.

The proprietor of the gas-works at Seaham has made a novel proposition to the consumers of gas in that place. He has invited them, by public advertisement, to assist him in testing the purity of the gas, and in order to do so he offers to supply the necessary tests gratis to all applicants. He further undertakes to immediately remedy any impurity that may be thus detected. As Mr. Smith, the proprietor of the gas-works at Seaham, is a druggist in the town, the offer thus made to test the gas with tests supplied from his own shop is liable to the suspicion that his principal object is to advertise the "chemical and drug warehouse" from which the tests are to be obtained; and the delicacy of the tests thus supplied gratis is also liable to be questioned.

Communicated Article.

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GAS AND WATER APPARATUS AT THE UNIVERSAL EXHIBITION OF 1867.

(*From our Special Correspondent*).

[*Continued from page* 696.]

Pipes undoubtedly form one of the most important parts of the apparatus connected with the manufacture of gas. They constitute a portion of the apparatus employed in the manufacture, and they distribute the gas into different parts of the town, where, by an immense ramification of branches, it is conducted into all the houses. Paper, bitumen, clay, wrought iron, cast iron, and lead are employed for this purpose. Copper pipes are also applied in the construction of varieties of apparatus in the lighting of rooms. Even woven fabrics, leather, and caoutchouc are used to conduct gas to the places required to be lighted or heated. It would be impossible to notice all the kinds of pipes to be found in the Exhibition; we meet with them in every direction, and in noticing those which are of greatest interest to gas engineers and manufacturers, we shall often have occasion to consider those connected with the distribution of water.

Earthenware Pipes.—Nearly all nations exhibit specimens of these manufactures. Generally they are designed for the purposes of drainage, or for water conduits. We observe, nevertheless, in the French department (Hangar, of the Boulevard du Nord, class 65), the exhibition, by M. Laforge, of Bollene (Vaucluse), of enamelled earthenware pipes, which are from $1\frac{3}{5}$ to 12 inches in diameter, and 1 mètre (3 ft. $4\frac{3}{8}$ in.) long, connected together by bands, and which have resisted pressures varying from 5 to 20 atmospheres, and which, if laid with care, might serve for gas-pipes. Messrs. Zeller and Co., of Ollwiller, near Soultz (Haut Rhin), the largest manufacturers of these enamelled pipes, have, during 25 years, laid them in many communes for the distribution of water, at a cost of from 40 to 50 per cent. less than cast iron. They showed us certificates from the directors of the Mulhouse Gas Company, from which it appears that they have laid down in that town since 1841 nearly 32,000 mètres of those pipes for gas, which are at the present time as good as at first. A portion of the gas-mains at Colmar also consists of these pipes, but such instances of their use are certainly very rare. We perceive, from a very interesting pamphlet on "Water-Pipes: their Construction and Preservation," sent to us by M. Zeller, that this skilful engineer has deeply studied these questions, and the numerous orders he has received prove that the merit of his manufacture is appreciated.

Cast-iron pipes, the use of which has been discontinued in France for the distribution of gas, are still the only kind employed in England. M. A. Durenne (Hangar, of the Boulevard du Nord) exhibits, near to his cast-iron pipes for gas and water, fitted with elastic hermetical and compensating joints (according to Lavril's plan), all the cast-iron apparatus necessary in a gas-work—such as cast-iron retorts, ascension-pipes, furnace doors, &c. He exhibits also many specimens of candelabras, and a cast-iron main very much bent, in which are combined all the joints, bends, &c., required in a large system of distribution. Messrs. Pinart and Co., of Marquise (Pas de Calais), exhibit, within a space unfortunately too circumscribed (Galerie des Machines), a very complete collection of pipes. Among these are pipes of the following sizes:—

Diameters from	1	in. to	1⅝	in. ..	Length, 1·50 mètre.
Do.	2	in. to	14	in. ..	Do. 3 mètres.
Do.	15¾	in. to	24	in. ..	Do. 3 & 4 „
Do.	32¼	in. to	40	in. ..	Do. 4 „

In another part of the palace may be seen specimens of pipes of enormous size. M. Pinart shows pipes of the size of 8 ft. 6 in. and of 18 ft. in diameter, for the mines of Fléchielle and Hardringham, and for the bridges of Culoz, Bayonne, and Argenteuil, in France, and for numerous works in Russia. It is the same large foundry that has supplied the pipes 1 mètre (3 ft. 4⅜ in.) in diameter which conduct the water of the Dhuis to Paris. That wonderful work, under the management of M. Belgrand, which was completed last year, consists in taking the Dhuis, an affluent of the Surmelin, which flows into the Marne at its source in Champagne, and conducting it for the distance of 130 kilomètres, with an incline of about 10 centimètres per kilomètre into Paris, and is of the greatest advantage to that city. Eighteen kilomètres of this work consists of cast-iron pipes 1 mètre in diameter, weighing together 10,000 tons; the remaining portion of the undertaking is a covered aqueduct 2 mètres high and 1·40 mètre wide. This conduit conveys daily 30,000 cubic mètres of water, which possesses extraordinary limpidity, into the magnificent reservoirs of Ménilmontant, which have a capacity of 100,000 cubic mèters, and are situated 80 mètres above the level of the Seine, and 108 mètres above the level of the sea. From those reservoirs the water is distributed to the highest storeys of the houses in Paris. M. Pinart has, in addition to his pipes, double disc valves with a spring inside, and easily accessible; stop-cock valves, with clack-valves resting upon a cast-iron seat; candelabras, brackets for lanterns, and the design of a tubular condenser for gas, with a current of air or a current of water, according to the plan of Renaut and Brunt, made entirely of cast iron, which want of space prevented him from sending in its actual form.

Messrs. Fortin Hermann Brothers, contractors for the water-works of Paris, exhibit apparatus of various kinds—fountains, meters, and cast-iron pipes, with the application of M. Belgrand's joint, which consists in enclosing two perfectly cylindrical tubes when placed together with a cast-iron band, lead being run between the band and the ends of the tube, and then beaten into the joint. By this arrangement a broken pipe may be quickly replaced without undoing the joints and disturbing the pipes in other parts.

M. Victor Thiebault, of Paris, has exhibited, near to the Salle de Conférence, a complete collection of apparatus for the distribution of water on a large and on a small scale, according to Douchain's system, the whole of which we cannot now describe: we shall only mention his method of joining cast-iron pipes with conical ends. A lead band is placed over the joint, which only requires to be beaten in to enable the joint to resist, as stated by the manufacturer, a pressure of 15 atmospheres. Among the cast-iron pipes we shall also notice the complete series, ranging from 1¼ in. to 14 in. in diameter, shown in longitudinal section, from the foundries of Terre Noire, La Vaulte, and Bességes; especially the collection of perfectly cylindrical pipes, cast without shoulders by a patent process, the largest of which is 4·10 mètres long, 1 mètre in diameter in the interior, and 25 centimètres (1 in.) thick. These pipes came from the celebrated establishment of Fourchambault, which supplies them to the works of Paris and to all parts of France, and even abroad.

We must also notice M. Marini's universal joint. This plan of jointing consists in having two loose flanches, two caoutchouc rings, and a small cast-iron band. The joint is made by putting on the end of each pipe the flanches and the caoutchouc ring which belongs to it, and then, putting over the end of one of the pipes the cast-iron band; they are placed end to end, and it is drawn over the point of junction. The caoutchouc rings are then placed at the opposite ends of the iron band, and they are pressed against it by means of screw-bolts. In the distribution of water this joint is very good, but it is to be feared that, if applied to gas-mains, the action of the hydrocarbons would after a time deteriorate the caoutchouc, although the points of contact are very small. At all events, this universal joint would be of great use in the arrangement of pipes for temporary purposes, as for theatres, illuminations, &c.

In the Belgian department, a cast-iron pipe exhibited by Messrs. Lucien Vander Est and Co., of Braine-le-Comte, excites surprise by its extraordinary size and by its excellent workmanship. It is 20 ft. 6 in. long, 28 in. in diameter only, and ⅜ of an inch thick. In the Belgian rotunda we have already mentioned the productions of M. V. Delperdange, engineer of the Northern Railway at Brussels, who exhibits his plan of jointing gas-mains. These pipes, without shoulders, are placed end to end, the points of junction are surrounded by a band of caoutchouc, which is covered with an iron ring, and squeezed into the joint by a screw. This joint, which is very simple, might be advantageously adapted in all places where the pipes are subjected to great vibrations. Last year the Paris Gas Company applied it in jointing the pipes on the wooden bridge of Asnières. This distinguished engineer also exhibits a method of making branches on cast-iron pipes. We shall conclude the notice of cast-iron tubes by mentioning those exhibited by Messrs. Albert Wever and Co., of Barmen (Prussia).

Wrought-iron Tubes.—It was the firm of Gandillot and Co. (class 40) who first engaged in this manufacture in France, and who, by their assiduity, have been enabled to compete with the English manufacturers. We were present in their works, at St. Denis, at the manufacture of a pipe 7 in. in diameter, the largest which they had at that time made. All pipes of the ordinary size are tested to a pressure of 30 atmospheres before leaving the factory, and they are guaranteed to 15 atmospheres. M. Gandillot has lately constructed, for the works at Mount Cenis, 10,000 mètres of pipes of 1¾ in. diameter, which were proved to 100 atmospheres. These iron tubes serve not only to convey water and gas, but the manufacturers are endeavouring to extend their use into every department of manufacture and into domestic use. They exhibit garden gates at very low prices; ladders which are extremely light, and which cost no more than wood; mangers also, which it is expected will be generally introduced into stables for the army. Messrs. Mignon, Rouart, and Delinières exhibit a complete collection of pipes, round, square, and elliptical; elbows, stop-cocks, indeed, all articles of the most complicated kind which can be made in wrought iron, among which there is a conical worm, the section of which at the opening is 4½ in., and which terminates in a small tube of only ⅛ of an inch diameter. M. Bouttevillain distinguishes himself by the excellence of his workmanship. His pipes are so perfectly cylindrical that they may be used as cylinders for pumps without turning. He shows the method of joining iron and copper tubes by merely inserting one into the other after turning the two ends. But England surpasses all other nations in this branch of industry; to be convinced of which it is only necessary to pass through the galleries of classes 40 and 53. We admire the fine collections of pipes of Messrs. John Brotherton and Co., of Wolverhampton, and of the Birmingham Patent Tube Company; and, in the Gallery of Machines, the complete displays of Messrs. Lloyd and Lloyd, of Birmingham, of Messrs. John Russell and Co., and of Messrs. James Russell and Son, of Wednesbury. The firm of Messrs. Lloyd, which can manufacture from 500 to 600 tons weight per month, especially attract attention to their pipes for boilers made of a homogeneous metal, which are likely to supplant the use of brass tubes in the boilers of locomotives, the price being not greater than a quarter or a third of the cost of the latter. Their gas-pipes are exceedingly good, and are sold at very moderate prices. Messrs. James Russell and Son, established in 1813, exhibit sixty different articles, among which we especially noticed a conical column 19 ft. 3 in. long, 14 in. in diameter at the base, and ¾-in. thick, steam-pipes, Bessemer steel tubes, and a hollow iron telegraph-post, with all the requisite accessories. This firm especially direct the attention of engineers to the employment of hollow iron in the beams of steam-engines. It is probably for the purpose of obviating the inconvenience arising from the rapid oxidation of iron mains, when laid in the ground, that Messrs. Russell and Son have covered them with an enamel, and that Messrs. John Russell and Son have manufactured pipes of galvanized iron, specimens of which are exhibited.

Pipes of Bitumenized Paper.—These pipes are made by passing an endless band of paper as wide as the length of the pipe through melted bitumen, and rolling it round a cylinder the circumference of which corresponds with the diameter of the pipe to be manufactured, until it obtains the required thickness. Another cylinder passes over the paper that is impregnated with bitumen, so as to spread the latter over it equally. The pipe, after being cooled and removed from the interior cylinder, is coated inside with a fine and insoluble varnish impermeable by gas or water, and the exterior is coated with a mixture of bitumen and fine gravel. The thickness of the paper employed, not reckoning the asphalte, is about a third of the total thickness of the pipe. The trials made with these pipes have proved that they are able to bear an internal pressure of 24 atmospheres, and the resistance to external pressure is considerable. These pipes, when exposed to the moisture of the ground for ten years, have remained unimpaired from the time that they were laid down. The impermeability, the inconductibility of heat, the power of resisting oxidation and the action of acids and alkalies, the elasticity, the lightness, and especially the cheapness of these pipes, have caused their adoption in a great number of water-works. They do not cost more than one-quarter the price of lead, and one-quarter that of iron. In the French section, Messrs. Jalouveau and Co. exhibit specimens of these pipes varying from 2 in. to 8½ in. in diameter, and 1·5 mètre long. In the German department, the company for the manufacture of bituminous paper tubes at Hamburg, appear to us to have surpassed the French inventors in the manufacture of these pipes, 7½ feet long, and in perfecting the joints. They exhibit pipes jointed by means of bands of iron filled up with conical rings of caoutchouc, and a joint made with a band of bitumenized paper, but the latter can only be applied to horizontal mains laid on very solid ground. Mr. Leye, of Bochum, Westphalia, exhibits similar articles to those from the manufactory at Hamburg. When pipes of bitumenized paper are used for gas, it is absolutely indispensable to line them with a thin coating of lead, and even in that case the hydrocarbons may penetrate to the bitumenized paper, and rapidly decompose the pipes. Although it is

said that this plan of laying pipes for gas is adopted in many towns in France—viz., St. Quentin, Chatellerault, Valenciennes, Dieppe, &c.—we do not think it can be recommended for that purpose generally. The pipe which combines the advantages of bitumenized paper with the solidity of iron appears to be that of Chameroy and Co., exhibited in the Gallery of Machines, class 65. In the numerous collections of copper tubes (class 40), we shall mention only, in the French department, those of Messrs. Roulet and Sons, of Vialette and Boulier, and especially those of M. Vicaire, who exhibits, very nicely arranged, yellow copper tubes of a thousand different forms—round, curved, oval, hexagonal, octagonal, of small and large calibres, twisted, &c., &c., plain, or in ornamental designs—in short, everything adapted for gas apparatus. In the English section, Messrs. A. Everett and Son are equally successful in their exhibition of articles in this branch of industry. In the German division, Messrs. Aron Hirch and Sons, of Neustadt, and Wieland and Co., of Ulm, deserve special distinction for their productions.

The manufacture of lead pipes, which are so essential for the distribution of gas, has representatives from all countries in the Exhibition. M. Eugène Hubin, of Havre, and Messrs. Deplechin, Letombe, and L. Mathelin may well call their pipes endless, since we see coils of them 2500 mètres long. In the German division, Messrs. Lindgens and Sons, of Mulheim, Odenthal and Leydendecker, of Cologne; and in the English division the house of Walker, Parker, and Co., are distinguished by the excellence of their workmanship.

Among the other means of conveying gas and water, the flexible tubes exhibited by Messrs. Lebon and Redon (class 65, France) appear to us to deserve especial mention. These tubes, composed of double spiral galvanized iron wire, are flexible at all temperatures, and are completely impermeable. They are made so as to easily resist great weights without being flattened, and an internal pressure of from 6 to 8 atmospheres; they are 5 mètres long, and are joined by means of screws. Their very moderate price gives them the preference over tubes of leather and caoutchouc, with spiral iron wire.

We must not conclude this review of the pipes in the Exhibition without noticing those of vulcanized india-rubber, so indispensable in the use of gas, the numerous manufacturers of which we cannot particularize. We must, however, direct the attention of visitors to a new chemical composition, called "Parkesine," by its inventor, Mr. Parkes (class 44, England), which is made of gun-cotton and other chemical compounds, and possesses all the properties of caoutchouc, and which, by its very low price, may advantageously supplant that useful natural product.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2371.—William Willmer Pocock, of Craven Street, in the city of Westminster, architect, for "*Improvements in indexes or tell-tales applicable to fluid-meters and other counting or measuring apparatus.*" Aug. 17, 1867.

2402.—Thomas Sault, of New Haven, Connecticut, U.S.A., now of 8, Southampton Buildings, Chancery Lane, in the co. of Middlesex, engineer, for "*Improvements in slide-valves.*" Aug. 22, 1867.

2414.—James Lee Norton, of Belle Sauvage Yard, Ludgate Hill, in the City of London, and George Hawksley, of Montrose Villas, Caledonian Road, in the co. of Middlesex, engineer, for "*Improvements in apparatus and means for burning combustible liquids, vapours, and gases to obtain heat and light therefrom.*" Aug. 22, 1867.

2422.—John Varley, of 57, Bloomsfield Road, Plumstead, in the co. of Kent, for "*Improvements in apparatus for raising, supplying, and measuring water to steam-boilers, part of which invention is also applicable to measuring water for other purposes.*" Aug. 23, 1867.

2435.—Walter Christopher Thurgar, of the city of Norwich, surgeon, for "*Improvements in apparatus for regulating the supply of gas to burners.*" Aug. 26, 1867.

GRANTS OF PROVISIONAL PROTECTION.

2245.—Charles Denton Abel, of 20, Southampton Buildings, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in combined gas and air engines.*" A communication. Aug. 3, 1867.

2253.—George White Dinsdale, of Upper Norwood, in the co. of Surrey, plumber, for "*Improvements in the construction and manufacture of traps for water-closets, drains, and other purposes.*" Aug. 3, 1867.

2289.—Johann Ernst Friedrich Ludeke, of Dransfeld, in the kingdom of Prussia, at present residing at 281, New Cross Road, New Cross, for "*Improvements in apparatus for obtaining motive power, and for raising and forcing water and fluids.*" Aug. 8, 1867.

2300.—John Davenport, of Bradford, in the co. of York, machine maker, and John Kilson, of Bradford aforesaid, pattern maker, for "*Improvements in or applicable to slide-valves for admitting the flow or passage of steam, water, or other fluids and gases when pressed.*" Aug. 10, 1867.

2307.—Frederic Hale Holmes, at present residing at Paris, in the empire of France, engineer, for "*Improvements in apparatus for the production of the electric light.*" Aug. 10, 1867.

2314.—Arthur M'Dougall, of the firm of M'Dougall Brothers, of the city of Manchester, manufacturing chemist, for "*Improvements in the extraction and separation of the sulphur contained in products resulting from the alternate exposure of certain metallic oxides to gases containing sulphuretted hydrogen and to oxygen.*" Aug. 12, 1867.

2320.—Henry Thomas Everist, of the Gas-Works, Kidderminster, in the co. of Worcester, for "*Improvements in apparatus used in the manufacture of gas.*" Aug. 13, 1867.

2334.—William Bradshaw Leachman and John Holroyd, both of Leeds, in the co. of York, for "*Improved apparatus for pumping fluids.*" Aug. 14, 1867.

2351.—Augustus Fraser Baird, of Pimlico, in the co. of Middlesex, lieutenant-colonel in the Bengal Staff Corps, for "*An improved earth-closet.*" Aug. 15, 1867.

NOTICES TO PROCEED.

571.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*Improvements in steam and gas engines.*" A communication. Feb. 28, 1867.

1026.—Stephen Matthews, of Chapel Row, Portsea, in the co. of Hants, for "*An improved combined lift and force pump.*" April 5, 1867.

1066.—James Robert Napier, marine engineer, and William John Macquorn Rankine, civil engineer, both of Glasgow, in the co. of Lanark, N.B., for "*Improvements in valve-seats.*" April 10, 1867.

1158.—Richard Hastings Frith, of 101, Lower Gardiner Street, in the City of Dublin, civil engineer, for "*Improvements in distributing and measuring gas, steam, water, and other fluids, and in the apparatus or means employed therein.*" April 20, 1867.

1217.—George Pollard, of Hayfield, in the co. of Derby, for "*Improvements in apparatus for reducing and regulating the quantity and pressure of steam, fluids, and gases.*" April 26, 1867.

2194.—David Hodge, of Hatton Garden, and Robert Christopher Witty, of Laurel Street, Dalston, both in the co. of Middlesex, engineers, for "*Improvements in apparatus to be used in making gas from petroleum and other liquids.*" July 29, 1867.

2253.—George White Dinsdale, of Upper Norwood, in the co. of Surrey, plumber, for "*Improvements in the construction and manufacture of traps for water-closets, drains, and other purposes.*" Aug. 3, 1867.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2000.—James Milbank, "*Improvements in hot-water apparatus for heating conservatories and other buildings or apartments.*" Aug. 11, 1864.

2009.—Hugh Dyer, "*Improvements applicable to chimney-tops and ventilators, and apparatus for cleaning the same and flues generally.*" Aug. 12, 1864.

2018.—Edward Andries, "*Improvements in means or apparatus for purifying every kind of water, and rendering it drinkable, and for rendering sea water fresh and drinkable.*" Aug. 13, 1864.

2072.—Francis Taylor, "*Improvements in apparatus for receiving, drying, or deodorizing human excrement.*" Aug. 22, 1864.

2086.—William Spence, "*Improvements in apparatus for raising and discharging water.*" Aug. 24, 1864.

2092.—Richard Pilkington, "*An improvement in gas-burners.*" Aug. 24, 1864.

Parliamentary Intelligence.

HOUSE OF COMMONS.

(*Before the Right Hon.* E. Cardwell, *Chairman; Mr.* J. Hardy, *Mr.* Peel, *Mr.* Goldney, *and Mr.* Lefevre.)

IMPERIAL GAS BILL.

TUESDAY, JUNE 18.

Mr. Hope Scott, Q.C., Mr. Denison, Q.C., Mr. Burke, Q.C., Mr. Webster, Q.C., and Mr. Richards, appeared for the promoters; Mr. Rodwell, Q.C., for the Metropolitan Board of Works; Mr. Wilkinson for the Vestry of St. Pancras; Mr. Pember for the Trustees of the River Lea; and Mr. O'Malley for the Corporation of London. Petitions were presented against the bill by the Fulham District Board of Works, the Regent's Canal Company, the East London Water-Works Company, the Vestry of Paddington, the Vestry of Kensington, the Grand Junction Canal Company, the London and North-Western Railway Company, and the Conservators of the River Thames.

Mr. Denison, in opening the proceedings on behalf of the promoters, said their case was even more simple than that of the Chartered Company because it was not complicated with the matter of capitalization of past profits, which had been done once for all in their case; and it was not likely that any company would run the risk of being again attacked for giving a benefit to the public by applying past profits to the increase of their works, instead of going to Parliament to get capital at the rate of 10 per cent. The object of the bill was a very simple one—that of enabling the company to comply with the requisitions of the Act of 1860, by which they were under an obligation to supply gas not only to all public bodies, but to all private people within the district who might require it. The company had been three years in the condition of having worked up to the very limit of their powers, both with regard to money and works; and he (Mr. Denison) thought the committee must have heard in the course of these proceedings, that the Imperial Gas Company tried as long ago as 1865 to get a bill through Parliament similar to this in both of its objects—increasing its capital, and obtaining a new site for its works, on account of the violent opposition to extending the works on the company's present sites, of which there were three at present, one near King's Cross, another in Shoreditch, and another at Fulham. They now proposed to make their new establishment at West Ham Abbey Marshes, which was not a very inviting looking place, being already occupied by distilleries, iron foundries, bone factories, starch-works and various chemical works. Soap, oil, naphtha, and manure—everything that could be pleasant to the eye, and not exactly good for food, was to be found in that neighbourhood. There was no opposition from the place where they proposed to put these works. With regard to the necessity of the extensions, he (Mr. Denison) thought

he should be able to deal with that in a few words. Ever since the year 1860 the company had been spending at least £100,000 a year in increasing their works in one sense of the word—he meant in doing more work on the existing site. The time had come when they could do it no longer, and according to the best calculations they could make they found they would have to spend about £160,000 a year for some years to come. The estimates of engineers seldom fell short of what was required; and if they took that as extending only over ten years that proved the necessity of raising £1,600,000 to provide for the necessities of the metropolis for only ten years to come. Again, they supplied one-fifth of the metropolis with gas—their parliamentary district which they were bound to supply extending over 16,000 acres, which was equivalent to 25 square miles. That was really a prodigious district for the supply of an article like gas, reaching through every street, and practically through every house. Another circumstance was that they supplied the most growing district of London, in point of building, and therefore the rate of increase in the case of the Imperial Company was more rapid than usual; for between the years 1860 and 1866 they had increased their supply from 1981 million cubic feet to 2380 cubic feet. Taking it in another way, in 1854, when the company obtained their last increase of capital, they were obliged to double their previous capital, which had existed for 20 odd years; and they were now proposing again almost exactly to double their capital. No doubt their opponents might say it was rather startling for companies to come before Parliament and at once ask to double their capital, and so it was, except when they considered that capital must be provided for a good many years to come, and not like railways, for a definite work to be done immediately. The present capital and the borrowing powers (and there was a reason for putting them together) amounted to about, £1,814,000; and they were proposing by this bill (again taking the capital and borrowing powers together, the latter being in the usual proportion of one-fourth) to raise £1,542,000. The reason why the capital and borrowing powers were put together was because there had been a certain amount of turning loans into capital under the general Acts, and he (the learned counsel) could not give the precise figures at that moment, though they could be divided exactly by the witnesses. When the company were before Parliament in 1865 they had no trouble about the capitals. The matter was investigated before Mr. Jackson (who was thoroughly conversant with such things), and though he expressed a little astonishment at the amount at first, yet, having the witnesses before him, he came to the conclusion that it was perfectly fair and reasonable, both as to the amount and the way it was to be raised and applied. But in that year they had another difficulty. They proposed to enlarge their Fulham works, and in the House of Commons they had no opposition on that point. They had some opposition about the works down the river. The members of the committee went to view the site, and came back satisfied; but in the House of Lords they had a formidable opposition at Fulham by a gentleman who had the advantage of being able to appear without counsel or witnesses; and the House—thinking, perhaps, it was impossible for a bishop to exaggerate anything—threw out the bill; at all events, it was thrown out on the second reading on the ground of its being an increase of existing works, which they were now avoiding. In 1866 they began in the House of Lords, where their bill was passed; but in the House of Commons, it met with an opposition somewhat similar to that upon which they had failed in the House of Lords the previous year, but with respect to a different locality—viz., Victoria Park. Without actually coming to a second reading, the committee withdrew that bill owing to the violent opposition. They then represented to the authorities that they had reached such a condition that they could no longer comply with the Act of Parliament. They had by great efforts gone on for three years building their works head over head—10 retorts in a bed when there ought only to be five; but the witnesses would tell the committee that the line was now come when, if they did not get increased money and increased land, they could not do what they were doing now. The company had no particular interest in increasing their works and capital, because they could no longer increase the capital at the old rate, Lord Redesdale having fixed the dividend at 7 per cent., at which rate they could not raise the money. It had been said by somebody on the other side that they had not offered it to the public. That was true in words, but false in fact, because a good deal was taken by the directors to get the company out of their difficulties, and those shares from time to time came on the market, and the public refused to take them. One witness had already said that it was impossible to get out any shares last year, but it was well known that shares of good character were got out in abundance at a less interest than 8 per cent. during the hottest of the panic of last year. But when agitation was constantly going on, and when a report was made like Sir John Trollope's, it was reasonable that the public, knowing nothing of the circumstances, or what evidence was or was not heard, should be afraid to take gas shares at 7 per cent., when they knew there was an annual agitation going on, which generally had only the effect of reducing the dividend below 7 per cent., if it had any effect at all. In fact, instead of making 7 per cent. by a sort of *quasi* preference, it might turn out not 6 per cent., or even 5 per cent., because if the prices were reduced, or the illuminating power increased, they knew what the effect would be. A reduction of 6d. per 1000 in the price of gas would make a difference of 50,000 a year in the profits of the Imperial Company. That was one of the things the agitators who got the Government to bring in their bill were trying for. In the long run, agitators in this country generally succeeded in getting something, and naturally the people who took gas shares remembered that very potent fact, and that accounted for their timidity. Those things had not yet begun in railways, and, therefore, people would take 6 per cent. preference stock in tolerably good railway companies when they would not take them in gas companies, subject to this perpetual agitation, and the risk of 7 per cent. turning out something less. The £325,000 of last year was simply a nominal power to raise that amount, and the difference between that sum and the sum which the directors took to extricate the company from their difficulties—say, £200,000 in round numbers—they could not get out, and the only way was to take leave from the committee to issue that at a higher rate than 7 per cent.. The bill proposed 8 per cent. They would be glad to do it at 7½ per cent.; but they did not think they could. Of course, if on the general inquiry the committee came to a conclusion favourable to the gas companies it might be that people would take it at 7½ per cent.; but, as they were all in the dark now, it would be imprudent to put anything else into the bill except the price at which they could fairly issue the money. But the company would not be content to give this general statement of their probably wanting £100,000 a year for 10 years to come. He (Mr. Denison) had an estimate from the engineer of all the things which were tolerably certain to be wanted within the next 10 years. Taking articles in the nature of lands, fences, wharves, bridges, and draining, the summation of those came to £78,200. That might be described as land and works connected with land. What might be described as in the nature of gas-making works—retort-houses, gasholders, purifiers, and so on—came out to £931,500. That was, in fact, the construction of one totally new gas-work, so to speak. Then for the mains, at the rate of £11 per mile, the estimate was £165,000; that would have to be done at once, to connect the new works with the existing mains and works. Then there were new mains likely to be wanted during the ensuing 10 years; they could only take that at a round figure, and put it down at £200,000. They were also forced to supply meters when demanded, and the cost for 10 years was reckoned at £90,000. Then there were the works in progress under the £100,000 which the directors took last year, amounting to £55,000; and of course additional capital was required, which they put at £30,000. All those sums together amounted to £1,550,000, in round numbers. To set against that, the capital authorized by the Act of 1866 not yet called up in shares amounted to £242,800, and borrowing powers £81,000, making a total of £324,000. The share capital now proposed to be raised was £975,000, and the borrowing powers one-fourth of that—£243,750. The committee would find that these three sums altogether would come pretty nearly, if not quite, to the £1,500,000 of the other sum; but it was rather a rough estimate, and of course it was not necessary it should fit exactly. There were a good many petitions against the bill, and he would take that from St. Pancras first. They stated—"That it does not appear that the shares thus created have been offered in the public market. That, notwithstanding, it is by the said bill proposed to raise the rate of dividends on such of the ordinary shares so created as have not been issued to 8 per cent." That he had explained already. "That the rate of dividends was settled after the fullest consideration of Parliament on inquiries conducted in 1865 and 1866, and the Act of 1866 was passed only on the limitation of capital and dividends, so that the consumers of gas might be enabled to have the full benefit of the statutes intended to insure a lower price than that now paid." When those gentlemen talked about the fullest consideration of Parliament it did not occur to them to mention 1860—when a much fuller consideration was given to the matter—when Parliament intended to secure the companies being left in a position to raise their dividends to 10 per cent. The only committee which did consider the question in either 1865 or 1866 did not fix on 7 per cent., but 7½; and full consideration was given to it by nobody but the gentleman who never heard evidence—Lord Redesdale. The petition then stated the amount of capital it was proposed to raise, and he had explained about that. Then it proceeded—"That the company have proceeded against parties for supplying any part of their district which the preamble of the bill assumes to be too large for the capital of the company." That seemed an odd paragraph, and he (Mr. Denison) could not understand how it was consistent with what must have been the case under the Act of 1860. He had inquired into that, and found there was a dispute on a very small question—viz., whether a small local company had a right to supply the Great Western Hotel or not. It was settled that they had a right, and he should have thought that too small a point to put in the petition. "That the dividends paid to the shareholders of the company for and in respect of the last six years have amounted to 10 per cent. by the year on the paid-up original capital in the undertaking, and there has been invested by the said company a considerable sum towards a reserved fund." Of course that was so, but it was only what the Act of 1860 contemplated, and was actually the thing for which that Act was recommitted; for the Imperial Company was in that year one of two or three companies that had already reached 10 per cent. And here he would correct a statement made by Mr. Davison in opening the general inquiry, when he alluded to something which he thought had been said by him when he was counsel for the bill in 1860. The fact was that he (Mr. Denison) warned the committee in 1860 (although he was for that bill then) that they were going beyond what it was probable. Parliament would continue to sanction. It was not often that counsel had to tell a committee that they were going too far in their own direction, but it was so in that case. Though it was true the company had put aside a considerable sum towards the reserve-fund, they had not put aside as much as they had power to do; and they had fallen short of the powers given to them by the Act of 1860. They had reduced the price in 1865, before the agitation, and if people would only be quiet the reduction would go on more comfortably and easily than if they kept agitating, as the companies had an interest in pleasing the public by reducing the price of gas so far as they could consistently with their own interests. As had been already pointed out, they had a kind of competition existing between their three establishments, and they exercised every ingenuity and adopted every contrivance to reduce the price. The next paragraph in the petition was this—"That in July, 1865, the company reduced their price to the rate of 4s. per 1000 feet, and in a short time, by virtue of the provisions of the Gas-Works Clauses Act, a further reduction of the rate for the gas furnished by the company to the district now lighted by them (including the said parish) would soon have to be made; but if the company be permitted to create further capital, the effect will be to retard the further and full reduction in the price of gas which your petitioners and the ratepayers of the said parish are looking forward to in consequence of the arrangements sanctioned by the Legislature in the year 1860." Now, he (Mr. Denison) did not really think that any but a parochial board would have written such a paragraph as that. The companies were forced in 1860 to supply gas where it was wanted, and people seemed to think that it could be done without money and without works. Was it meant by this paragraph that another company was to come in? Somebody must supply the growing district north of London, and the Imperial could not do it without an increase of capital and works, and therefore it must be by a new company. He (Mr. Denison) would be glad to know if those parochial people expected any one would be foolish enough to start a new company to enter upon the Imperial Company's districts, even without competition, to find new works, have an additional staff, and involve themselves in new machinery of supply at a cheaper price than the old company could do with their existing staff and existing experience? "That the said bill does not contain any provision for the application of the additional capital or mortgage money, nor limit such application to works either already commenced or proposed by the said bill." There was a manuscript clause on the table stating that the money should be applied to the works authorized by the bill; so that objection was now inapplicable. "That the company have the gratuitous use of the land under the public roads of the metropolis, and the paving of the streets is often damaged by the relaying and repairs of the mains of the company, which have been from time to time considerable." Had they forgotten the company paid rates the same as everybody else? They knew perfectly well that every pennyworth of repaving was done at the company's expense. The petition then stated that by several Acts relating to the metropolis special clauses had been enacted for protecting the streets and regulating the modes and times of breaking up the paving, and that the present bill proposed to repeal all the protective provisions in the said Acts, and to allow all the streets to be dealt with under the Gas-Works Clauses Act, 1847, which was wholly insufficient for the metropolis. That was wholly unfounded, and it would be found that that was a sort of mare's nest sat upon in St. Pancras. He (Mr.

Denison) had now read every material word in the petition, and it was gratifying to find there was not one sentence of complaint about the manner in which the company had exercised their powers; not a word about the price, about the illuminating power, about the purity or about the public lamps. He now came to the petition of the Metropolitan Board, which commenced with a statement of facts about the sewers, streets, &c., being under their management, and then went on to state that it was proposed by the bill to authorize the company to purchase land for the erection of their works at West Ham Abbey Marsh and to make a new road, and that plans and other documents had been deposited, from which it appeared that sewage and drainage works, under the control of the petitioners and vestries and district boards, would be interfered with, and that streets and public thoroughfares would be crossed and altered; but that was a mere engineering question. Then they said, "It is not expedient, as alleged, that the company should be authorized to purchase the lands described by the said bill," though they gave no reason why. In short it was a general petition by the Metropolitan Board. Paddington came next on the list, but he (Mr. Denison) did not know whether they appeared by counsel, and he would wait till they did. Marylebone did not appear, neither did the Regent's Canal. The East London would give no trouble. The River Lea Trustees complained about some bridges, which they said could not be erected without serious interference with the navigation; and they also stated that they were the owners of land in the parish of Bromley St. Leonard's, which was available for building purposes; but he had already given an account of the nature of the land With regard to the navigation, that was a matter of engineering, and when the time came there would, doubtless, be an engineer speaking upon it. He (Mr. Denison) was told there was an existing bridge close above where they were going to put their bridge, and the company had taken exactly the same headway as the existing bridge.

Mr. PEMBER said that was not the only bridge; there was the Tilbury and Southend Railway Bridge, and there was a clause in that company's Act rendering it incumbent on the railway company to turn that into a swing bridge at any time that the River Lea Trustees demanded it.

Mr. DENISON: You want us to turn it into a swing bridge, I suppose?

Mr. PEMBER: That is one thing.

Mr. DENISON said that was a matter of detail which they could discuss when the time came.

The CHAIRMAN said that, having heard the statement of the learned counsel, the committee would be glad to revert to the general case.

Mr. DENISON, referring to the order of the other House, which made the greatest possible expedition in the present progress of the bill desirable, inquired if the chairman, in case the committee should pass the bill, would afford all the help that was in his power for enabling the company to get over the difficulty.

The CHAIRMAN said he would do so.

The COMMITTEE decided not to hear evidence in support of the bill until the inquiry upon the Metropolis Gas Act Amendment Bill was concluded.

TUESDAY, JULY 9.

Mr. BURKE, at the close of the proceedings on the Metropolis Gas Act Amendment Bill this day, addressed the committee, urging that either the necessary capital for increasing the works should be granted to the company, or that they should be released from their parliamentary obligations to supply gas, which they would inevitably be unable to supply if such powers were not granted. The learned counsel proposed to offer evidence in support of his application.

Mr. RODWELL and Mr. O'MALLEY objected to the company's bill being proceeded with.

Mr. RICHARDS, in support of the application, stated that he believed on the 24th of December, 1869, the company would require to send out 4 million cubic feet of gas more than they sent out on the 24th of December, 1866.

The room was then cleared, and, on the parties being readmitted,

The CHAIRMAN said the committee adhered to the fifth of the resolutions communicated to the parties on the 3rd of July. They were further prepared to consider proposals for carrying the Chartered and Imperial Companies respectively over the interval between the present time and the time at which any works which may be sanctioned by Parliament in the session of 1868 shall come into operation.

THURSDAY, JULY 11.

Mr. HOPE SCOTT said the promoters had had a bill prepared in the sense in which his learned friend, Mr. Burke, addressed the committee at the last sitting—viz., for the purpose of relieving them from the penal consequences of non-supply, if that non-supply should arise from inability on their part to give it. He might remark, with regard to that, that, thinking it over under every possible aspect, he did not see how any other plan could be adopted short of taking the bill as it originally stood. The company had the command of money at that moment for the extension of their pipes and mains, and their difficulty was a manufacturing difficulty. With regard to that, the committee knew the repeated efforts which had been made to obtain a site. The company had now selected one to which there was no opposition that he knew of, therefore the opportunity was very favourable for acquiring it. That was the object of the bill. It was not to obtain money to enable the company to improve their supply by the subordinate action of pipes and so on, but to acquire a site where they could manufacture more largely than they were able to do at present. If the committee objected to their obtaining that site, and of course the necessary capital to acquire it, there was no other plan than to relieve them from the penalties to which they would be exposed. Upon this point they respectfully claimed to be heard in evidence. As yet the committee had only heard the statement of their case, and the company were very anxious to put on record the reasons which would be given by the witnesses why they made this application in the first instance, and, supposing that to fail, why the alternative application became necessary. [The alternative bill submitted by the learned counsel contained the following clause: —"Notwithstanding anything in the said Metropolis Gas Act contained, it shall not be obligatory on the company to supply gas within their district beyond the capacity of their existing works, or until Parliament shall have granted to them additional means for extending their works."]

Mr. RODWELL said he might save his learned friend the trouble of calling witnesses. He was perfectly willing to accept the statement made by Mr. Richards on the previous day as representing fairly the state of the affairs of the Imperial Gas Company. That would suffice for him to found an argument against his learned friend's proposal.

Mr. HOPE SCOTT said if Mr. Rodwell was willing to accept as evidence the statement made by Mr. Richards, the object of the company was obtained.

The CHAIRMAN: But it will be open to us to call evidence if we are not satisfied.

Mr. RODWELL: The case rests now upon the statement, of my learned friend, Mr. Richards, that for this year and for the next year they will want no increased power, but in the winter of 1869-70 it is possible they will.

Mr. RICHARDS: That is not exactly what I said.

Harry Chubb, Esq., examined by Mr. RODWELL.

Mr. RODWELL: Will you kindly listen to this statement, which was made by my learned friend, Mr. Richards, at the last sitting of the committee:—"I wish the committee distinctly to know the position of the Imperial Company, that it may not be said hereafter that the committee were in ignorance of their position. I think I can state (I may be wrong) the probable increase of demand, taking the average of the last 20 years. On the 24th of December, 1869, I believe we shall require to send out 4 million cubic feet more gas than we sent out on the 24th of December, 1866—I mean the Imperial Company alone. I am allowing for the contingency of four or five foggy days preceding that. We have at the present moment no means of adding one single retort to the works, I believe. We can get through the winter of 1867-8, and I hope, with luck in weather, we may scrape through the winter of 1868-9; but I give you my word that we cannot possibly meet the winter of 1869-70. If the legislation passes over this year, no spade can be put in the ground by the local authorities or any one else earlier than October, 1868, and no works can be constructed between October, 1868, and the winter of 1869, with the necessary appliances sufficient to supply that 4 million cubic feet which will be required." Is that a correct account of the state of affairs of the Imperial Gas Company?

Witness: It is.

Cross-examined by Mr. WILKINSON: I think that on the occasion of the companies application for their bill of 1866 the application was opposed by the vestry of St. Pancras. That opposition was withdrawn upon an agreement entered into between the vestry and the company, dated the 29th of June, 1866, one of the clauses of which provides that, from and after the 31st of December, 1866, the charge per 1000 cubic feet for gas supplied to St. Pancras for the public lamps should not be higher than the lowest price charged by the company to any railway company in the parish. Since that date the company have lowered the price, according to the terms of the agreement. That agreement is not at all referred to in the present bill, nor will it in any way be thereby interfered with. I should doubt whether it would be competent for the company at once to discontinue the supply on those terms. I am not prepared to undertake that the price shall not be increased, or to state any terms for the supply of gas to the parish of St. Pancras. In the adjoining parish of Marylebone the public lamps are charged 3s. per 1000 cubic feet, as near as possible, as against 3s. 3d. in St. Pancras. I was not aware till you mentioned it that the agreement was terminable in any way. I have no authority whatever to make any fresh agreement with the parish. The subject has not been under the consideration of the board. I met the committee of the vestry of St. Pancras by their request, and they made several propositions to me, which I told them I did not believe could be entertained; but the question of the agreement has not been brought before the board, under the impression that the time had not arrived for considering it. It has certainly never been entertained by the directors, and I have no authority to answer yea or nay to it. The site of the company's works in St. Pancras is already so fully occupied that it is almost impossible to construct additional works there.

Re-examined by Mr. RICHARDS: The agreement with the parish of St. Pancras says that, from and after the 31st of December, 1866, the charge for the public lamps shall not be higher than the lowest price charged by the company to any company in the parish. This bill does not touch that agreement in the least.

By the CHAIRMAN: Our charge to ordinary consumers is 4s. A different price is, by special agreement, charged to large consumers, the railway companies particularly. The public lights are charged less than the charge to general consumers. In Marylebone it is 3s., and in St. Pancras 3s. 3d. per 1000 cubic feet. I think I explained on the previous occasion that in Marylebone there has been an agreement of many years standing, and the price has never been raised. St. Pancras, on the contrary, is a reduced charge from the one which previously existed. The company, in almost every case, repair the public lamps. Some parishes do it themselves. I do not say that we supply the public lamps at a loss, but what the profit is I am not prepared to say. I ought to explain that there are other parishes, and the more numerous, in which the charge is 3s. 6d. I have not thoroughly considered the question whether it is more profitable to supply a private consumer or a public light.

The CHAIRMAN: Do you really mean to say, with your great experience as the secretary of a company which supplies one-fourth of the metropolis, that you cannot tell me off-hand whether it is more to your profit to supply the average private consumer or a public light?

Witness: My impresion off-hand is that the private consumer is more profitable.

The CHAIRMAN: Notwithstanding which you supply the public lights at 3s.

Witness: I should say that the private consumer is more profitable to supply.

By Mr. WILKINSON: The company supply the public lamps in the parish of Bethnal Green, as well as Marylebone, at the rate of 3s. The parish of St. Pancras pay for the repairs of the lamps.

By the CHAIRMAN: The company do the repairs, the parish paying, in addition to the charge for the gas, about 16s. or 17s. per lamp per annum for lighting, extinguishing, cleansing, and general repairs.

By Mr. GOLDNEY: The companies do this at cost price; it scarcely amounts to the expense. The companies incur all the risk whether it will cost more or less.

By the CHAIRMAN: The lowest price charged to any ordinary consumer for gas is 4s., with a discount of 5 per cent. to very large consumers. The railway companies pay 3s. 3d. The reason for this is that they bear all the losses of leakage over a very large area inside the meter at which the gas is delivered to them. There is also prompt payment, with no risk of bad debts, and there are other advantages that we get in things which fall on the railway companies and not on the gas company.

Mr. RODWELL addressed the committee, and asked them, on the part of the Metropolitan Board, as representing the consumers, not to pass any bill at all dealing with this question. They would, he thought, be satisfied, from the statement made by Mr. Richards, that such a bill was unnecessary, because it was to be assumed that there would be some general legislation before any very distant period. And he submitted that the committee before whom that legislation must come would be more competent to give relief to the parties than a committee which was asked to deal with a bill laid before them on the part of this company. The clause in the alternative bill which proposed to relieve the company from the obligations of the Act of 1860 was quite indefinite. The committee were not in a position to say what was the present capacity of the company's works. There was no evidence on the subject, and it must not be left to rest upon the view taken by the company with reference to it. And, if the proposal were adopted

that they should be relieved from the obligations of the Act of 1860 until Parliament granted them additional means for extending their works, it would be giving them an indefinite exemption. He submitted that the committee should not deal with the question at all, because, by the resolution and the report they would make, they would point at all events to the possibility, if not the probability, of the local authorities taking up the matter, and satisfying Parliament that they were the proper persons to be entrusted with the supply of gas. In that case the necessity of making any distinction with regard to the Imperial Company, as to capital or site, fell to the ground; this bill would become utterly useless, and there would be no pretence for the company having this power. By refusing to pass this bill no harm would be done to the company, and certainly none to the public, because, according to the statements made by Mr. Richards, the company would at all events be able to continue the supply of gas until 1870. He would sum up his case with a sort of resolution which he ventured to submit for the consideration of the committee, though with great deference, because he knew it was an unusual thing to do:—"That the Imperial Gas Company, having stated that if they fail to obtain in the present session of Parliament the power of acquiring additional land, they will be unable in the winter of 1869-70 to meet, by means of their present works, the wants of the public in any increased demand for gas, and may by that means become subject to penalties for default in meeting the demand, the committee are of opinion that the relief of such company from the penalties arising from the postponement of legislation in the present session of Parliament will properly form a consideration upon any bill which the company may submit to Parliament in the next session." He had drawn up that resolution, and proposed that the committee should deal in that way with the question instead of putting a clause into the bill. He believed that no one could be prejudiced by this course; whereas the other course might embarrass any future inquiry upon the subject.

Mr. BURKE said his learned friend had missed the point altogether. He admitted in the first place the statement made by Mr. Richards, which was a perfectly true statement—viz., that the company's works, although adequate for the supply of perhaps one or two years (though that was a matter of extreme doubt), were positively incapable of affording a supply for the winter of 1869-70. But then his learned friend ignored altogether this most important part of the statement, that unless the company had the means of erecting additional works now or at an early period it would be impossible for them to be prepared when their means of supply became insufficient.

The CHAIRMAN: Can you show us that a bill passed next session would not accomplish the object as well as a bill passed in this session?

Mr. BURKE said he could. It was an engineering question, and the committee should have evidence upon it. This was the third year the company had come to Parliament for the purpose. It was with infinite difficulty that a gas company could procure land anywhere for constructing works. There was a great disinclination on the part of persons to have gas-works near their property, but the company had succeeded this year in making a conditional contract for land, which contract expired this year. It was a contract by which they would be enabled to take that land at a certain price, provided Parliament gave them the power this session. If they did not obtain the power the contract expired, and *non constat* that that land might not be devoted next year to another purpose. The company were charged with expending too much money, but they were driven to Parliament from time to time, at an enormous expense, with these inquiries. The committee had it before them that whenever the case of the company had been inquired into by a select committee the conclusion had been arrived at that they were right in their application; yet year by year they had been defeated, first by the House of Commons, and then by the House of Lords, on the second reading of the bill. The company had been exposed to this enormous expenditure year by year, which of course protracted the period at which they could reduce the price of gas to the public. The committee would observe that this was a public question. The company were perfectly indifferent about the acquisition of this land. It was no easy task for them to try and raise money at all in the present state of agitation in reference to gas affairs. If no legislation took place this year in some way, what would be the result? Even assuming that next year the company could obtain land, the time which it would take to erect works on it must be considerable, and it might happen that in the year 1869 or 1870 a large district of London would be without gas. Look at the inconvenience to the public, and the danger to the company, if they were not in a position in 1869-70 to meet the demand upon them. Suppose the night before Christmas Day the gas at a theatre went out, the company were liable to an action for breach of contract to a great amount. A parliamentary obligation was put upon the company, and they were told, "You shall supply gas, whether you will or not;" and at the same time, when they came before Parliament in three successive years to ask for means to do it, on each occasion they were told, "You shall not have the means, and you shall continue the supply." They got some money indeed, for he (Mr. Burke) was obliged to go to the chairman of the committee of the House of Commons and point out their position, and they obtained leave of the House to restore so much of their bill as gave them the necessary capital to complete existing works—*i.e.*, for those works which were now as full as they could hold. They could not make another foot of gas in those works; and, in fact, they were in such a position that if Parliament did not give them fresh powers the public must go without gas. The company desired to relieve themselves of that obligation if Parliament declined to give them power to fulfil it. His learned friend (Mr. Rodwell) said: "Delay legislation till next year, in order that the public authorities may be called upon to supply gas." But why should the company be obliged to supply gas even in that case? If Parliament said next year, which he hoped they would not do, that the public authorities should supply gas, why should the company be obliged to supply it? Why put on them an obligation they could not fulfil if other people were to be authorized to give the supply? His learned friend suggested a resolution, which was a new thing to do, and he (Mr. Burke) maintained that the resolution should emanate from the committee, and not from a parliamentary agent. That resolution proposed to postpone the question until next year. The result of that, if carried, must be that the company would have to take their chance of finding another site. They must lose the large expenditure hitherto incurred, they must bring forward a new bill at a great expense, and, after all, there would be considerable doubt whether it would be possible at that time to erect works which would enable them within the time stated to supply the wants of the public. Before sitting down, he could only repeat the statement that it was with no selfish view the bill was promoted. Speaking as a director of the company, and not as counsel, he would say that it was no bed of roses to deal with gas matters. He would rather be relieved from the obligation; it was full of difficulty with regard to raising money, but they were anxious to fulfil their obligations if Parliament would enable them to do so.

Mr. RODWELL said if his learned friend spoke as a director and not as counsel, he (Mr. Rodwell) ought to be allowed to speak as a consumer. He would only say that his learned friend had supplied the very argument which he wanted.

The CHAIRMAN: We have expressed not only our readiness but our desire to amend the Act of 1860, if we can do so in a way which we think is justifiable, having regard to the just claims of the consumers. Mr. Burke wishes to have it altered in that part which is of use to the companies; but is not willing to have that altered except to a degree which we think inadequate, which is the great *commodum* to the consumer. If you can show that it will not be in the power of Parliament, by legislation in the next session, to prevent public inconvenience, we shall be quite ready to go into the necessary evidence.

Mr. *Thomas Kirkham*, examined by Mr. RICHARDS.

I am one of the engineers of the Imperial Gas Company. The quantity of gas which that company supplied on the 24th of December, 1866, was 16,800,000 cubic feet. My experience tells me that from year to year, for some years past, there has been generally an increase of about 10 per cent. Last year we were fortunate in the matter of the weather, there being no succession of foggy days immediately preceding Christmas. When there is such a continuance of foggy weather, it causes a great demand upon the company. Calculating the increase of 10 per cent. for the year 1867 as compared with 1866, and for the year 1868 as compared with 1867, allowing for the possible contingency of foggy days, we should have very great difficulty with our present power, even if we could do it at all, in supplying the maximum demand in the winter of 1868. We have now as many retorts on the works as in my judgment we can erect. Allowing for the probable increase in the demand in the winter of 1869 as compared with 1868, I think that we could not meet it. On the 24th of December, 1869, the increase upon the corresponding day of 1866 will be very nearly 4 million cubic feet. In erecting new works, we should, of course, erect them not only with the view of supplying the quantity absolutely wanted, but somewhat with a view to the future. Looking to the position of the proposed new works, and the approaches over the river Lea at Bow Creek, it is probable that more than two years must elapse from the time a spade was first put into the ground until the time when the works were in a condition to deliver gas. There will great difficulty down there with regard to the water, and I am afraid we shall not come to the clay. Then there are the retort-houses and purifiers, and all the other apparatus to put up for the manufacture of gas. The capital required must be raised simultaneously with the erection of the works, if not before. If legislation be postponed for a year, and the work be entrusted to any one else, it could not be done in less time than I have mentioned.

Cross-examined by Mr. RODWELL: If any one else constructed works we should not be relieved from the necessity of supplying the district. We want increased gasholder room and purifiers as well as retorts. We need, in fact, fresh works, for we cannot extend the works where we are. The amount of retort accommodation depends no doubt a good deal upon the rate at which the gas is distilled from the coal. Gas is not, as a rule, distilled much quicker from cannel than from common coal, but in some cases it is. If a larger quantity of cannel were used in the existing works, a greater illuminating power would be obtained, and there would be a diminished consumption. If legislation be delayed for another year, so far as I can see a certain portion of the public will be in darkness.

Mr. HOPE SCOTT, in reply to the CHAIRMAN, said the company had no difficulty in obtaining money to carry on the distribution of gas from their present establishment. What they required was capital for new works and new mains, to meet the increasing demands coming upon them.

Cross-examination continued: We should have to lay two new 48-inch mains from the new works into our district. We require a constant extension of mains in our district; this takes place to the extent of something like £20,000 per annum.

By Mr. WILKINSON: We have sufficient leading mains in St. Pancras, but we should have to enlarge the small mains from time to time there is no doubt. I am not prepared to say that no such enlargement will be required in the next twelve months. We do not propose to erect any additional works at the St. Pancras station. I know the new street made by the Midland Railway Company, called Suffolk Street. I am not prepared to say at the present moment whether we should have to interfere with that street.

By Mr. PEMBER: The length of time it would take to erect works is in proportion to the quantity of gas we should have to make. Our works at Fulham will this winter be equal to the manufacture of 6 million cubic feet per diem. The capital asked for in the present bill is £975,000. That capital would enable us to erect works of greater capacity than those at Fulham. We propose that they should be adequate to the manufacture of 16 or 18 million cubic feet. We should erect a fixed bridge over the river Lea, and carry our pipes over it. No doubt it would be possible to carry our pipes under the river. There are at present railway bridges over the Lea. I do not know whether they are fixed or swing bridges. I was not engaged in preparing the plans for these works; they were made by Mr. Clarke, our engineer at that end.

Mr. RODWELL: Would there be any difficulty, if there were a sudden demand, in making temporary arrangements with other companies for the supply of gas?

Witness: I believe there would be a difficulty. I do not think that any of the neighbouring companies could give us any assistance at all. I know that such a thing was done for the London Company after the Nine Elms explosion.

By Mr. PEMBER: Our works at Fulham have been in operation 40 years, and have been increased from time to time till they have reached their present capacity.

By the CHAIRMAN: We should be prepared for the demand upon us this winter for gas, even if no bill passes this session. Next year there would be a difficulty, but we hope to be prepared for it. The difficulty we anticipated is with regard to the supply of gas in the winter of 1869-70. There would not be sufficient time to erect works to meet that difficulty if no legislation takes place till next session. After this winter we shall have no power of adding to our present works for the purpose of supply. Our land is completely covered with apparatus except at Fulham; but we are stopped there by the Act of Parliament. The Bishop of London, and some others in the neighbourhood, stopped us. We have land there, but we cannot use it. The public are very sensitive to an improved quality of gas. In my opinion they do not diminish their consumption to the extent supposed when they find they get the same light with a smaller consumption. Occasionally in the winter it is so, for when we are hard pressed we put more cannel in, and that decreases the demand to a little extent; but it is very small. The anticipated difficulty in the winter of 1869-70 would extend over the months of December and January, speaking generally. An increased supply of cannel during that period would not wholly carry us over the difficulty. If we used a great quantity of cannel it would interfere with the whole of our manufacture; we should want more purifying power,

and have to put up additional apparatus, which we have not the means of doing at Shoreditch or St. Pancras. We might do it at Fulham if we could use the land. I suppose if we were to use 20 per cent. more cannel, taking the burners as they exist, it would not make more than from 5 to 8 per cent. difference in the consumption; the burners are not suited to burn that high illuminating power.

The CHAIRMAN: We were told by a former witness that the public were very sensitive about that, and that they availed themselves of it in the consumption of gas the moment they obtained a higher quality.

Witness: I have not found it so in my experience.

Mr. RODWELL: Will you refer to Mr. Hawksley evidence, which was the foundation of my question to this witness, on cannel gas?

The CHAIRMAN: Mr. Hawksley being examined rather on the price, gave this answer. He is asked by Mr. Denison—"Now this estimate assumes that the quantity of gas sold remains much the same at present in each district?" and he answers, "It assumes that, and the assumption is inaccurate to a very large extent. It assumes that the companies will still continue to sell 8653 million feet of gas per year; but the fact is that the moment you put on a higher quality the consumption becomes almost exactly proportionately reduced; everybody turns the tap on. If a frost comes, and we have not gas enough to supply through the night, we throw in a lot of cannel and make the gas considerably richer, and the consequence is that every one turns the tap down, then the gas which would not have lasted through the night does last through the night." Do you agree to that?

Witness: That is not my experience here in London. If the burners were altered, there is no doubt that that would make a difference; but I do not find that it makes the great difference which is supposed. It does to an extent, but it is very small.

The CHAIRMAN: I want you to answer me considerately, and not hastily. Do you mean to say, and do you desire the committee to take it as the basis of legislation, that, looking at the power of increasing the quality of the gas, and looking at the power which, among other companies, you have of making arrangements for supply in times of difficulty, you really foresee great inconvenience to the public in the winter of 1869-70, if no special legislation like this is adopted now?

Witness: I do.

Mr. RICHARDS: With regard to the assistance from other companies, could you name a single company to whom, in any stress, you could apply in the winter?

Witness: I do not know of any company that would be able to assist the Imperial Company. We may assist small companies, but they cannot assist us.

Re-examined by Mr. RICHARDS: When the explosion took place at Nine Elms, we were able to assist the London Company largely from our works at Fulham. But there is no company which, taking into consideration our consumption, would be able to help us under similar circumstances. The Nine Elms explosion was in the month of November, before the heaviest demand had taken place. The Act of 1860 only contemplated the supply of two qualities of gas, whether cannel or common coal be employed—viz., 12 and 20 candle gas—therefore any increase of illuminating power short of 20 candles must be supplied at 4s., which is the price for 12-candle gas. In order to change from common to cannel gas we must give, under the Act of Parliament, three months notice.

Mr. RICHARDS: So far as regards the consumer's burner, does your experience tell you that there is any inconvenience in raising largely the quality of gas—say from 13-candle gas up to 18-candle gas or 19-candle gas, during the winter months?

Witness: There are great difficulties with the burners. I find that the case myself in my own house. The burners are not suited to consume cannel gas, and the consequence is, you get smoke upon the ceilings, and so on. My experience does not enable me to form an opinion with regard to the saving that would be likely to ensue in the quantity of gas sent out by largely increasing the illuminating power.

Mr. RODWELL: Mr. Hawksley gives you the precise figures. He was asked, "If the gas were raised to 18-candle gas, the consumption would, instead of the 8600 millions become 6450 millions?" and he replied, "Yes, just about that."

Re-examination continued: In asking for the capital authorized by this bill, we are looking forward to a very much larger increase in the consumption during the next ten or twelve years. The company do not want to come to Parliament every year, and in purchasing land we should purchase for the ultimate purposes of the works. The company have now the refusal of the land for this year. I have never heard of gas-pipes being carried over a swing-bridge.

Mr. PEMBER: I did not suggest that.

Mr. RICHARDS: You were asked whether the gas-pipes might not be carried under the river Lea. Are you aware at what depth they would require to be carried at Bow Creek?

Witness: I think that the whole depth, to the bottom of the tunnel there, would be something like 16 or 18 feet below high-water level; and we must go considerably lower to carry our pipes under the tunnel. That would be, in an engineering point of view, a most undesirable way of carrying gas out of the works, and it would involve an extra cost, because we must have a bridge as an approach for carts. Those syphon-shaped pipes going under the Lea would form constant receivers for the gas water, and we should have to pump them continually with a double lift from the bottom.

The CHAIRMAN: Suppose the companies were more united than they are—I mean, supposing they were amalgamated, and that the whole system of districting were revised, would they be able to supply a larger quantity of gas for consumption from their present works than now?

Witness: They would, no doubt, to a certain extent, if there were arrangements made to district properly.

The CHAIRMAN: Would such an arrangement tend to remove the difficulty you suggest?

Witness: Not the whole of it; the other companies have an increase the same as we have, and they must increase their works.

The CHAIRMAN: But you and the Chartered Company are the only companies before us for this purpose. There would be actually the power throughout the metropolis of supplying a larger quantity of gas to the consumers from the same works and mains?

Witness: No doubt we should be able to supply a larger quantity of gas, if the districts were properly arranged.

The CHAIRMAN: Putting together those two powers—the power I have just suggested, and the power of increasing for a short period the quality of the gas—do you undertake to say that would not carry you over the period of difficulty in 1869-70?

Witness: It is my opinion that it would not.

The CHAIRMAN: You state that very positively?

Witness: Yes; it is a very large work to supply 4 million cubic feet.

Mr. BURKE: Is not the area of supply something like 26 square miles?

Witness: About that, I think. It is about 25 or 27 per cent. of the whole, I believe.

By Mr. RODWELL: The supply of gas from the Imperial to the London Company at the time of the explosion in 1865 lasted about 22 days. I do not exactly know what the quantity supplied was.

Mr. RICHARDS: That was when we had a surplus.

Mr. RODWELL said he now found that his case, which he thought to be a good one, was very much improved by the evidence that had been called. The company's own witnesses corrected the statement made by Mr. Richards, and he submitted to the committee that 16,800,000 cubic feet was their heaviest day's consumption, upon which the increase required was 10 per cent. On the evidence of Mr. Hawksley it was clear that, by means of appliances at their command, they could do what they always did on Saturday nights—viz., put in a quantity of cannel for the purpose of increasing the supply. The real object which the company had in coming before the committee was not for the purpose of relieving the public from the annoyance of being without gas, but for the purpose of establishing a right. He submitted that if any legislation was passed in this session authorizing them to construct these works, or to increase their capital, they would argue that the district was their own, and would interpose (and perhaps successfully) against any future legislation. It would be better, therefore, to leave the committee, who would have to deal with the whole question, to deal with the question of relief, which in his opinion was a question of burners, or the introduction of cannel coal.

Mr. HOPE SCOTT said his learned friend had adopted the evidence of 4 million cubic feet more gas being required for the winter of 1869-70 than was required for the winter of 1866. He had adopted that, and he was going to prove that the resolution which he had submitted to the committee was quite sufficient. The question that arose was whether the works could be constructed by anybody in time. The evidence of the engineer distinctly proved the contrary. Failing in that, his learned friend had proceeded, upon an arithmetical process of his own, entirely to deny the evidence which he had before admitted. He (Mr. Hope Scott) was no great arithmetician, but perhaps his learned friend would follow him in the following figures:—In 1866 the consumption being 16,800,000, 10 per cent. on that was 1,680,000. Adding these figures together, the consumption on the 24th of December, 1867, would be 18,480,000 cubic feet; 10 per cent. on that, which was 1,848,000, added to this gave for Christmas, 1868, 20,328,000 cubic feet. At Christmas, 1869, taking 10 per cent. on the 1868 figures, they got a consumption of 2,032,800 cubic feet, which added together made a total at Christmas, 1869, of 22,360,800 cubic feet. Deducting the 16,800,000 in 1866 from that, it would be found that 5,560,000 cubic feet was the result. As a matter of fact, the company would merely scrape through 1868-9 with difficulty, and then their whole powers would be exhausted.

The CHAIRMAN: You appear, Mr. Rodwell, for the Metropolitan Board, and oppose both bills?

Mr. RODWELL: I oppose both the granting of the powers and the relief in this shape.

The CHAIRMAN: But you, on the part of the consumers, are willing to run the risk?

Mr. RODWELL: Yes; if we thought the consumers would be left in darkness, the Metropolitan Board would be the last people to send me here to oppose the scheme.

The CHAIRMAN: I only want to get the facts. Mr. Burke told us that it did not signify much to the companies, but that it signified more to the public. The companies want to be relieved from penalties. What I wish to ask you, as simply representing the Metropolitan Board of Works, is, whether you, on the part of the consumers, are willing to run the risk?

Mr. RODWELL: Distinctly, yes.

Mr. HOPE SCOTT: With the risk of penalties upon us?

Mr. RODWELL: No; we run the risk.

The CHAIRMAN: There are two mischiefs suggested to us. One is, that the public would be seriously inconvenienced by the absence of the supply of gas; and the other, that the company being under penalties to supply their districts, would not be able to do that, and would be subject to penalties which they would have no means of avoiding. With regard to the first of these suggested mischiefs, I ask if you are willing to run the risk on the part of the consumers, and you say, Mr. Rodwell, that, distinctly speaking for the Metropolitan Board of Works, you are willing?

Mr. RODWELL: Yes.

Mr. BURKE: The companies will supply as much as they can, no doubt, and so the public are safe so far.

Mr. HOPE SCOTT: We have another engineer who will give you the details of the works, if you go on with the inquiry; but I understand this to be a preliminary inquiry. If you go on with the bill we will give you further evidence on these points.

FRIDAY, JULY 19.

James St. George Burke, Esq., Q.C., examined by Mr. DENISON.

I have been a director of the Imperial Gas Company for more than 20 years, and when the late governor died I filled the office for some time, until I found that my avocations did not permit of my giving proper attention to the duties, and then I resigned. I was governor of the company in the year 1860, when the Metropolis Gas Act was passed. It has been stated more than once that the Act of 1860 was a benefit to the gas companies. All that I can say, from my knowledge of the affairs of the Imperial Gas Company, is, that it was simply, with regard to that company, a bill of pains and penalties. The Imperial Company in the year 1854 were authorized to double their capital, with a dividend of 10 per cent. on the capital so to be raised, and with the power of making up any dividend out of the surplus profits which might have been less than the 10 per cent. in any year. The company were in a position to pay their 10 per cent. and to lay by a reserve-fund, and under the provisions of their Acts of Parliament, on the authority of which their capital had been subscribed, they were in the position of maintaining their 10 per cent. dividend and paying back dividends. They were under no compulsion to supply the gas, and they had the power to charge for laying down services and other privileges, all which were taken from them by the Act of 1860. By that Act they were compelled to supply gas whenever it should be called for in their district. They were prevented from paying back dividends for more than six years, and they were placed under various penalties which they had not been subject to before. Therefore, instead of deriving any benefit whatever from that Act, their position was materially impaired by the passing of it. The value of the districting to them was nothing, because then we were competed with in several districts; but, nevertheless, we paid our dividend. At that time it was very materially discussed with us, whether we were not far better protected by the competition which we were then subjected to than we could be by any districting. We came to the conclusion that we were merely wasting capital by keeping two mains in juxtaposition to do the work which

one main could do; but we acquiesced in the districting under the conviction that we gained no protection whatever by it. It has been beneficial to the public to a great degree. I do not deny the fact that the system of districting, by avoiding the unnecessary outlay of capital, has been the means of economizing the expenditure; but inasmuch as the Act gives to the public the whole benefit of the reduction of the expenditure—viz., by compelling us to reduce the price when the dividend reaches the maximum, the public have derived exclusively the whole benefit of the Act of 1860, and the company have derived none. With regard to the districting, the Act of 1860 simply says that there shall be no competition unless it be authorized by Parliament; but it does not prevent the intervention of Parliament in authorizing a new company if any company should have failed to fulfil their obligations That Act having assigned to us a district which is, I believe, one-fifth of the whole metropolitan area, compelling us to sell gas within that district whenever called upon to do it, we found three years ago that our works were getting so full that it would be utterly impossible for us to fulfil our obligations to the public unless we had additional works and capital; and therefore three years ago, in the autumn of 1864, we gave notice of a bill to enable us to raise large additional capital, and to construct works somewhere near Bow Common. We selected a site which we believed to be wholly unobjectionable, surrounded everywhere by all kinds of manufactures and "nuisances"—we purchased land there for the purpose. It is almost impossible for a gas company to bring in a bill with compulsory powers to buy land; they must negotiate beforehand, and ascertain what will be the probable objections in the neighbourhood, before they can venture to acquire land. But we did negotiate for, and obtain a very admirable site, on the banks of the river Lea, in the neighbourhood of Bow Common, and we brought in a bill to enable us to erect works there, and to increase our capital. That bill was referred to a committee of the House of Commons, presided over by a gentleman of great experience in gas matters—viz., Mr. Jackson, the present member for North Derbyshire. The committee took the trouble to go down to the spot to inspect it, and they came back perfectly satisfied with the propriety of our choice of that locality; they were also satisfied with our evidence, and they passed our bill. I should state with regard to the bill, which was brought in in 1865, that though it has been said that the companies reduced the price to 4s. on a pressure from outside, and from a fear of public legislation, in that bill of 1865 the Imperial Gas Company volunteered themselves the introduction of clauses reducing the price to 4s. as a maximum. The agitation did not commence till long after the bill was lost.

Mr. PEMBER, at this stage of the proceedings, said he was happy to state that the River Lea Trustees had come to terms with the promoters.

Examination continued: After a full inquiry before the committee in 1865, our bill was passed by the House of Commons. It gave us power to raise a large additional capital, and we had powers and land available for further works. There was no successful opposition to the bill in the House of Commons. There may have been a local opposition, but there was none which was successful against the construction of any works at Fulham. After the inquiry in the House of Commons, the bill went to the House of Lords, and there the Bishop of London, who has a palace at Fulham, took great objection to the enlargement of our works there, where we had a large space of land most advantageously situated for the construction of the gas-works. The Bishop of London having succeeded, on the objection being raised on the second reading in the House of Lords, by a majority of 3, in securing the rejection of the bill, the effect was to get rid of powers which were substantially unobjectionable, relating to a totally different neighbourhood. The bill was thrown out without any inquiry being gone into about the Bow site, or any judicial inquiry at all about Fulham. In 1866 we renewed the bill, and the inquiry began in the House of Lords instead of the House of Commons; and there, again, we were fortunate in having a most competent chairman in the late Lord Llanover, who, in the year 1854, had represented the borough of Marylebone, and who had taken a strong part in opposing the Imperial Gas Bill, and knew all our affairs. The whole question was investigated, and the committee passed unanimously our bill giving us power to erect works at Bow; but we had been obliged to concede to the Bishop of London a clause under which we most reluctantly restricted our works at Fulham. When that bill, which we will call the Bow bill, came into the House of Commons, an objection was taken on the second reading, just as in the previous session in the House of Lords—not to Fulham, but to the Bow works; and then again, without any inquiry whatever, such a strong opposition was raised on account of the site being within a few hundred yards of Victoria Park, that the company were forced to withdraw the bill. After the rejection of our bill on the second reading, I went to Mr. Dodson and pointed out the extreme difficulty of our position—that we were under parliamentary obligations to supply gas, and had not 6d. capital —that we had incurred large debts, and that unless we had the means of raising the money, we could not go on, even filling our present works. Mr. Dodson took up our case, and the House of Commons allowed us to raise £325,000 to enable us to go on at all. That enabled us to pay our debts, and to fill up our works to such an extent that they are now choked, and we can go no further.

The CHAIRMAN: Did that bill pass?

Witness: Yes. We had raised, or endeavoured to raise money, and in the House of Commons the committee granted us 7½ per cent. for our new capital, but when we got to the House of Lords, Lord Redesdale chose to reduce it to 7 per cent., though we remonstrated strongly with him. We have not been able to issue all our capital. The public did not take to the shares issued at 7 per cent., and they have been selling at a considerable discount in the market; but still, among our own proprietary and directors, we have raised enough to keep us going. We are now worse off than we were three years ago. We took time by the forelock, to be prepared for any exigency that might arise, and now it is impossible to fulfil our obligations unless we provide new works, which the engineer tells us will take two years to construct.

The CHAIRMAN: A few days ago you asked this committee to pass a short alternative bill to relieve you of your obligations.

Witness: We are perfectly indifferent. If Parliament will relieve us of our obligations, I can only say, as a director, that I should very much prefer that to the passing of this bill, because, as I said the other day, it is no bed of roses to be connected with a gas company at all, or to try to raise capital, because the whole capitals of the companies are so depreciated by the agitation that people will not take shares; and though I am asking power to raise large additional capital, without which the public must go without gas, yet I know that if I get that power I shall have very great difficulty in exercising it. We now propose to take powers to raise money at 8 per cent., and inasmuch as, by the concessions we have been driven to make in the Government bill, we are called upon to reduce the charges in two years to such a sum as I believe, in my conscience, will largely reduce the dividends of the companies, my conviction is that we shall have great difficulty in issuing that stock at that price. I may say that we are the only gas company that has been subject to so low a dividend as 7 per cent. All the other companies have had 7½ per cent. It was an experiment made upon us (not, I hope, *in corpore vili*) to raise capital at 7 per cent., and it has utterly failed.

The CHAIRMAN: The bill was drawn up and printed before you knew what would happen in committee, was it not?

Witness: Yes.

The CHAIRMAN: You say your opinion is that the effect of the general bill will be to reduce your dividend?

Witness: I will put it in this form: The Imperial Company's accounts have been published *de anno in annum*, in accordance with the provisions of the Act. No objection has ever been taken to them, and no objection could be taken to them if they were subjected to any investigation you like. In those accounts it will appear that the Imperial, at their present price of 4s., do not maintain their maximum dividend, and taking off 3d. per 1000 feet will reduce their revenue applicable to the dividend by £25,000 per annum; and every additional candle, if estimated at 2½d., which is the lowest you can put it at, will affect their dividend to the amount of £20,000 at least per annum. Inasmuch as we are forced to give two more candles, and to reduce our price, you will reduce our dividend to the extent of £60,000 or £70,000; and as our present revenue applicable to dividend is about £150,000, you will see that, unless there is an enormous elasticity in the company to enable us to make up the deficiency in the two years before 1869, the result of this will be to largely reduce the dividend.

The CHAIRMAN: I suppose it is considered that the new outlay will be, for some years at least, unprofitable?

Witness: No doubt, while the works are under construction, and we are raising this money with an obligation to pay 7½ per cent., it will be some time before the new works will produce anything.

The CHAIRMAN: Do I understand you to say that the 2½d. per candle will take off £25,000, and that the two candles will take off £20,000 more?

Witness: No; I say each candle, but I am giving the figures quite offhand. I should state that our shares are held to a great extent by persons of very moderate means, to whom the dividends are of no small importance. If you investigate our accounts you will see that a vast number of ladies and others hold shares, and many of them I myself induced to invest in that undertaking, believing that under parliamentary sanction it was a perfectly safe security; but it has not turned out so, because parliamentary sanction appears to be worth nothing.

Mr. DENISON: But if the public would not take your capital at 7 per cent. last year, when there was to be no new expenditure in works and land, and no bill reducing your price and raising your illuminating power, do you believe that they will take it now, when all those things exist?

Witness: No; I would far rather, as a director, be relieved of the obligation—I mean for that simple reason, that I believe we shall have very great difficulty indeed in what they now call floating the stock.

Mr. DENISON: A question was put yesterday by me to one of the witnesses of the Chartered Company, which may possibly affect you. Mr. Evans said that their works would enable them to supply the other companies—the companies which he is contemplating supplying are the City and one or two others—you, I suppose, would not wish to avail yourselves of that site?

Witness: No; not at all. We investigated that site ourselves after we were deprived of the means of purchasing land at Bow Common. We investigated a great variety of sites, and eventually we came to the conclusion that we would select land on the river Lea, where we have contracted for the land conditionally already, as the most advantageous for us to supply our district economically; but we must incur very considerable expense in laying down pipes, even on that spot. Our district being the most northern of all the metropolitan companies, we naturally look for a site in the north of London. The arrangement with the Board of Trade contemplates there not being more than four companies in the amalgamation. Our company is as large as two or three others. I am told that our area is about 35 square miles. The committee will not think that is not a large area for one company. On our heaviest day last year we sent out 16 million feet of gas. I do not know whether honourable members consider the amazing amount of care that is necessary from night to night to supply such an enormous district, to be sure that everybody shall have gas, and that on a night like that there shall be no disappointment. It is a very great responsibility.

Mr. DENISON: Suppose you were to amalgamate with any other companies, the Independent on the map looks like being the only one that you could naturally amalgamate with.

Witness: I do not know whether an amalgamation would be practicable. We occupy so large an area that I think among the four companies we might be very likely left alone; neither do I see that we could secure any great economy by amalgamating with any company. It would not be any material addition to our district if the Chartered Company were to amalgamate with some other company, and leave to us the independent portion of their district.

The CHAIRMAN: Suppose, for financial purposes, the whole of the companies were amalgamated into one body, and that they then divided themselves into districts for the convenience of supply, and that one supply was from the point which was asked for by the Chartered Company yesterday, would it still be convenient to the amalgamated body to have this other supply in West Ham Abbey marsh?

Witness: I believe so. I am satisfied that if you look to the increase of London and to the supply of gas from time to time it would not be at all too much to give the two. And there is another reason, which is this, that every year it is becoming more and more difficult to find a site. You are now obliged to give notice to all the owners, lessees, and occupiers within 300 yards, and wherever houses have sprung up you encounter great opposition. It is a most fortunate thing for us to be able to get the site of the old Congreve rocket manufactory, where there is at present no opposition; but buildings are going on everywhere, and you cannot tell what opposition may spring up, so it is of immense importance to take advantage of obtaining that site at West Ham, where we can barge our coals up, where we are at a low level, and where we are at the nearest mercantile place from which we could lay down pipes for the purpose of supplying gas.

The CHAIRMAN: Is the price of the land a very large portion of the expenditure, or do the buildings and plant take up a large portion of it?

Witness: You will get that from the engineer; but I believe that the value of the land is about £1000 an acre.

The CHAIRMAN: Supposing that we were contemplating, in the interest of the consumers, the most economical supply of gas possible, and that the whole financially were one district—from your acquaintance with the subject, do you think it would be expedient, looking at it in the light which I have mentioned, to secure to the amalgamated body the piece of land in question?

Witness: I do not entertain a doubt about it—not the slightest.

Mr. DENISON: The estimate for the land forms only £78,000 out of all this money?

Witness: No; the land, I see, is £39,700, fences £2000, and so on.

Mr. DENISON: Yes; land proper is £40,000, but we must call all that land. Now the Metropolitan Board of Works are here still, and I believe that their point against you is the difference of price between the public and the private lights?

Witness: I should state that we are very anxious to obtain an opinion from Parliament that will settle that question. I know of no greater difficulty in connexion with gas companies than—if I may say so without offence—the cupidity of the vestries. On every occasion of gas companies coming to Parliament, these vestries being united bodies, with funds at their disposal, invariably attack gas companies, in order to see if they cannot get an advantage in the public light to the prejudice of the private lights. It stands to reason that the lower you charge for the public lights, the higher you must charge the private consumers if the companies are to maintain their dividend at all. On various occasions by private concessions, in order to avoid opposition, the vestries have succeeded in getting a scale of charges too low as compared with the charge for private lights.

Mr. DENISON: It was rather the habit of committees a few years ago to concede that to vestries, was it not?

Witness: I am afraid it has more often been conceded by companies privately to conciliate the opposition of vestries; but of late some committees have taken the opposite view, and said that the lowest price charged to the private consumer should be the guide to the price charged to the public lamps.

Mr. RODWELL: Clause 44 in the general bill is all we ask you to introduce here—"A company shall not charge a higher price per 1000 cubic feet for gas supplied to any local authority than the lowest price per 1000 cubic feet charged by them at the same time to any other local authority or to any private customer."

The CHAIRMAN: Do you agree to the principle of that clause?

Witness: No; not the latter part of it, and for this simple reason. This was fully discussed in the year 1860, and the vestries endeavoured to obtain a similar clause at that time, but in the Act of Parliament of 1860 you will find an exception made with respect to the contracts. That was a subject of very great discussion in the committee, and was sanctioned by the committee in 1860 upon that discussion. It does not give to the vestries the right to claim the lowest charge made by the company under special contracts.

Mr. DENISON: It is the 37th clause of the Act of 1860: "The gas company shall not charge a higher price by the one thousand cubic feet for gas supplied to any local authority, than the lowest rate by the one thousand cubic feet from time to time charged by them to any private consumers, otherwise than by special contract in writing, in the district supplied by the the gas company."

Witness: Yes; the history of it was this: it so happens that there are some very large consumers whom the companies can really afford to supply wholesale, and cheaper than the public lights. Take, for instance, a railway company. One railway company may pay us as much as £3000 or £4000 a year, and we supply it all into one meter, therefore they incur all the risk of the distribution of the gas, and they pay us with great regularity. We can afford, practically, to sell gas cheaper to them than we can to supply gas to the public bodies, which is distributed from street to street to the various lamps, in which there is a considerable amount of possible waste, and where we know that the consumption almost invariably exceeds the contract. The supply to a railway company is almost equal to supply in bulk. We are willing to supply to all persons alike who consume gas under the same circumstances; but it is not reasonable that we should supply the public lamps at a price which would be remunerative in the case of supply to a railway company.

The CHAIRMAN: But, under the present law, you are judges of that yourselves?

Witness: Yes.

The CHAIRMAN: Have you any objection to have that made a matter of arbitration when there is a dispute?

Witness: No. Anything that is fair I have no objection to.

Mr. DENISON: Let us be clear about what you are the judges of.

The CHAIRMAN: If you supply the North-Western Railway Company, you do it at a cheaper price for the reasons which you have given?

Witness: Yes.

The CHAIRMAN: And then the vestries complain, and as the law stands under the Act of 1860 the vestries have no tribunal to go to. Are you content, Mr. Rodwell, if that is provided for—if an arbitration is provided to meet such a case, are you satisfied?

Mr. RODWELL: Yes, sir.

The CHAIRMAN (to witness): are you satisfied to give that?

Witness: In many Acts of Parliament—I could mention a dozen cases—the provision is simply this, that the gas companies shall be compelled to supply the public lamps at such a price, and in case of a difference between the parties it shall be decided by arbitration. I have no objection to an arbitration.

The CHAIRMAN: But what I understood was, that if you were bound to supply all parties equally, that would really prove in practice to be making a difference in the actual charge; and I understood Mr. Rodwell to say that some one else must be the judge of that.

Witness: I will willingly consent, on the part of my company.

Mr. RODWELL: The words in the Act of 1860 are, "Otherwise than by special contract in writing." That makes the whole clause inoperative. My concession would be simply this, that the gas companies should be compelled to supply gas to all parties consuming gas under the same circumstances at the same charge, and if a difference arises with regard to the circumstances, then that there shall be an arbitration.

The CHAIRMAN: What we mean is this—we do not intend that any one consumer shall have an advantage over any other consumer, because that consumer would be paying what really goes into the other consumer's pocket. The principle seems to be quite admitted between you, I think. The 38th clause provides for an arbitration: "If any difference arise between the local authority and the gas company with respect to any alteration in the test, or to the rate to be charged for gas supplied, or for lighting any public lamp, the difference shall be referred to and be determined by arbitration in the manner prescribed," and so on.

Mr. GOLDNEY: But we do not want any general arbitration.

Mr. RODWELL: That is inoperative. "Otherwise than by special contract in writing"—that is where it is evaded.

The CHAIRMAN: We do not mean this to be evaded.

Mr. RODWELL: There is one other point, and that was with regard to the interference with Suffolk Street and the Great Northern Railway. We have entered into some arrangement with that company under their Act of Parliament, and all we ask is, that in carrying out your works you should not interfere to prevent out carrying out our arrangements.

Witness: I do not know anything about that.

The CHAIRMAN: You spoke of the Act of 1860 as having been an Act of pains and penalties; had it any material effect in reducing the price of your shares?

Witness: No; nor in increasing them. Our shares had been selling after we were paying 6 per cent. at an average price of £85 the £50 shares. That is to say, the investments paid the investors something like 6 per cent., and the Act of 1860 in no degree improved that position of things. Until this agitation £85 was about the average, and this agitation has reduced them to £63.

The CHAIRMAN: You look upon the agitation as very prejudicial to the value of your property?

Witness: Very obviously so, and it is very ruinous to some parties.

The CHAIRMAN: Bearing upon the terms at which the new capital can be raised, do you think that those terms are much prejudiced by agitation?

Witness: There is no douht that if the agitation ceased all the companies would be in a better position. We are told now by those with whom we are trying to make a settlement—by Mr. O'Malley on behalf of the corporation and by Mr. Grove on behalf of the Board of Works—that they will go on agitating. That is what we are threatened with *de anno in annum*. That has been the case with the gas companies for the last few years.

Mr. LEFEVRE: The shares rose to a price to pay 6 per cent.?

Witness: Yes, about that. The ladies and others who wanted a higher rate of dividend than that of the funds have been very much induced to invest their money in gas companies—at all events, in my own company—under the notion that it was a good and secure investment at 6 per cent., and so it has been if we were left alone.

Mr. LEFEVRE: If the agitation ceased, I suppose the shares would rise again?

Witness: I cannot say. With the reduction of price which we have been obliged to yield under this pressure, I cannot say if the shares would ever attain that value again. In the course of years, if the consumption increases, my own conviction is that the companies, if left alone, would, under the operation of the 10 per cent. clause, gradually reduce their price. The clause has worked admirably well, and gradually the companies have reduced the price. When I joined the Imperial Gas Company they sold gas at 9s. per 1000 cubic feet, and we now sell it at 4s. under the operation of that clause; and if we are left with the enjoyment of that monopoly, then, by the husbanding of our resources, we shall go on, I have no doubt, reducing the price, and so I hope, with the increased supply, we may be enabled to recover the value of our shares.

Mr LEFEVRE: But in times when there is no agitation the public will invest in shares that will pay them 6 per cent.?

Witness: The public invested freely in the gas companies at a price which would give them 6 per cent. A great quantity of property changed hands at that price.

Mr. LEFEVRE: You said that there was something peculiar about the district of the Independent Gas Company, which enables them to supply gas at 3s 4d., I think?

Witness: Yes; it stands to reason. The Imperial supply Hampstead, Highgate, St. John's Wood, full of villa residences, where we have to lay down many yards of pipe to supply one house. In the case of the Independent, which supplies a densely inhabited district, 100 yards of pipe will include a great number of houses all consuming gas, whereas a great part of our pipe is unproductive. One portion of our district is densely populated, and others are not so good; but we charge a uniform price throughout the whole district.

Mr. LEFEVRE: But looking at the district of the South Metropolitan Company, and judging from the map, it must be a good deal like your outlying districts?

Witness: I do not know; but some of their districts are very densely populated, which enables the company to supply gas cheaply.

The CHAIRMAN: Do you state that you had considered what the probable effect of the amalgamation would be?

Witness: No; I have not had time to consider that; but I do not see that we could amalgamate with any company so as to effect any material reduction of our price. I believe we have endeavoured to conduct our works as economically as it is possible to do, and no attempt has been made to show that they are not economically conducted. I would challenge any inquiry into that. I do not think that any company could conduct their works more economically than the works of the Imperial Company are conducted.

Mr. LEFEVRE: Would the purchase of this new land enable you to dispense with any of your present premises?

Witness: No, not at all; on the contrary, we must increase our staff and have a local resident engineer. That would be a totally new establishment. We do not propose to remove any of our works.

Mr. PEEL: The Imperial Gas Company could not receive any benefit from the amalgamation, you say?

Witness: I do not see that we could receive any benefit from an amalgamation. I speak without having gone into a detailed consideration of the subject; but I know that the efforts of my company have been invariably to keep down their charges as far as they could, and sell gas as cheap and as good as possible to the public. We supply all the parishes at a considerably less price for the public lamps than 4s. per 1000 cubic feet. I cannot give the exact average; but it does not much exceed 3s. 3d. I am just now told it is about 3s. 4d.

Mr. *Joseph Clarke*, examined by Mr. DENISON.

I am one of the engineers of the Imperial Gas Company. The plan on the wall shows the exact site of their proposed works. The district supplied by the company comprises about one-fourth of the whole metropolis. I never knew that it was the intention of the Imperial Company to interfere with Suffolk Street at all. There was certainly one occasion on which the company said that they intended to buy houses.

Mr. RODWELL: I think we have settled this. We put in "limited to three years," and that disposes of our difficulty. But with regard to the Metropolitan Board of Works there are two other matters. The first is as to the proviso to clause 6; it is—"Power to purchase lands for gas-works and to manufacture residual products." We, as persons who look after the comfort and health of the public, think that there should be a proviso to the effect that nothing in this last-mentioned Act, or any other Act, shall prevent the company from being liable for an indictment for nuisance, or other legal proceedings, if they create any nuisance. That clause gives them certain powers to sell and dispose of the residual products and the refuse of the material. What we ask is, for the protection of the public, to see that they conduct their business properly as far as they can, and that there should be no difficulty in the way of parties instituting legal proceedings against them for anything against the public health and comfort.

The CHAIRMAN: In the copy which is now placed in my hands, on the part of the promoters I suppose, those words are inserted.

Mr. RODWELL: That is quite sufficient. Now will you look to clause 7? There are words which we seek to introduce in line 34.

The CHAIRMAN: In my copy line 34 is struck out.

Mr. RODWELL: On this point my mouth is closed; we are now satisfied—the agents have done what we wish. But there is another point. This is what I propose to the company: "That from and after the passing of this Act the companies shall not charge a higher price to any local authority per 1000 cubic feet supplied to any public lamps within the company's district than the lowest price for the time being charged to any consumer; and, in case of difference between the company and any of the local authorities with regard to such price, the same shall be determined by arbitration, in the manner provided for by section 38 of the Metropolis Gas Act."

Mr. DENISON: That does not hit the mark. Mr. Burke says they supply to a railway company nearly in bulk, say at 3s. 3d. How is the arbitrator to know anything more than that fact?

Witness: Under that clause he could not get behind that fact, and therefore he might give to St. Pancras, for instance, gas at 3s. per 1000. That is not what you mean, sir?

The CHAIRMAN: Certainly not; what we intended was this—*primâ facie* all parties should have it at the same price, and if there be a difference it should lie on the company to show the reason for that difference, and that they must show that reason to somebody else—that is to say, to an arbitrator—and if they satisfy the arbitrator that the reason they give it cheaper to the North-Western Railway Company, for instance, is because it costs them less, and therefore they are able fairly to give it cheaper, then the arbitrator shall uphold the arrangement; but if not, he shall set the arrangement aside.

The committee then retired, and on their return into the room,

Mr. DENISON said: I am happy, sir, to say that the clause is now agreed upon and settled.

The CHAIRMAN, having looked at the clause, said: You have left it exceedingly wide, I think. I suppose it is your wish to leave it so.

Mr. LEFEVRE (to witness): What is the extent of land that you are already in possession of?

Witness: Forty-nine acres.

TUESDAY, JULY 23.

The promoters not being willing to accept the conditions laid down by the committee in reference to the Metropolis Gas Act Amendment Bill, it was resolved that this bill should not be proceeded with.

REPORT OF THE COMMITTEE.

The select committee on the Metropolis Gas Bill have agreed to the following special report:—

The "Metropolis Gas Bill, 1867," was introduced by the President of the Board of Trade, as an amendment of "The Metropolis Gas Act, 1860," and in consequence of the report of the committee which, in the session of 1866, inquired into the operation and result of that Act. It will be convenient, therefore, to advert in the first instance to the principal provisions of the Act of 1860.

The supply of gas to the metropolis is furnished by thirteen companies, which formerly were exposed, in several districts, to keen competition with each other. But in the year 1853 the companies south of the Thames, and in the year 1857 the companies north of the Thames, entered into arrangements for terminating that competition, and divided the metropolis into districts, upon the principle of exclusive supply. These arrangements were followed by complaints from various local bodies consuming gas for public lights, and from other consumers; and in consequence of these complaints, after long inquiry and protracted discussion, the Act of 1860 was passed. Its principal provisions, so far as it is necessary to state them for the present purpose, are embodied in the following sections, viz.:—

"10 & 11 *Vict., c.* 15, *incorporated with this Act.*

"II. 'The Gas-Wokrs Clauses Act, 1847' (except so far as the provisions thereof are inconsistent with this Act), is incorporated with and forms part of this Act, and shall apply to the several companies before named or referred to as fully as if the gas-works of the several companies were authorized by this Act; and the expression 'undertakers' in the recited Act shall be held to apply to every gas company affected by this Act; but it shall not be lawful for any gas company, by the application of any of their profits or funds, to make up to the prescribed rate or the rate of ten pounds per centum per annum, where no such rate shall be prescribed, any dividend which shall have been payable more than six years previously.

"*Sanctioning Assignment of Districts to Gas Companies to be Subject to Triennial Revision.*

"VI. The limits of each of the said companies shall be the respective districts supplied with gas by such companies as the same are defined upon four duplicate maps, signed by the Right Honourable Thomas Henry Sotheron Estcourt, and which maps have been severally deposited with the respective clerks of the peace for the counties of Middlesex, London, Surrey, and Kent; provided that, at the expiration of three yehrs next after the passing of this Act, and of every three years thereafter, Her Majesty's principal Secretary of State for the Home Department for the time being may, either upon the application and with the consent of any two or more of the said gas companies whose districts adjoin one another, make any alteration in the boundaries of such districts; or upon the application of any local authority, or upon the requision of not less than twenty gas consumers within any district or districts proposed to be affected, and upon proof to his satisfaction being given that any of the said gas companies are not in a condition adequately to supply with gas their respective districts, or have substantially failed to fulfil the obligations imposed by this Act, may make such alterations in the boundaries of such districts, or admit any new company respectively as he thinks proper; and all such alterations shall be certified on one or more maps, to be signed by the said Secretary of State, and deposited with one or more of the said clerks of the peace; and such last-mentioned map or maps shall be binding on all parties, and the provisions of this Act shall be held to apply to the several districts when so altered, and to the several companies affected thereby, as fully and effectually as if no alteration in such districts had been made, and no other company or person than the company to whom such limits are for the time being assigned or shall hereafter be assigned shall supply gas for sale within the said limits, unless authorized by Parliament so to do; provided that, before proceeding to consider the necessity for altering any of the said districts the said Secretary of State shall cause at least one month's notice to be given of such application to all parties interested therein or affected thereby, and such notice shall state the day and hour when and the place where such application will be considered; and notices to be given to any gas company shall be left with the secretary or some other principal officer of the company, and notices to be given to any local authoritry shall be left with the clerk or some other principal officer of the said local authority.

"*Illuminating Power and Purity of Gas.*

"XXV. The quality of the common gas supplied by any gas company shall be, with respect to its illuminating power at a distance as near as may be of 1000 yards from the works, such as to produce from an Argand burner having 15 holes and a 7-inch chimney, consuming 5 cubic feet of gas an hour, a light equal in intensity to the light produced by not less than 12 sperm candles of 6 to the pound, each burning 120 grains an hour; and the quantity of cannel gas supplied by any gas company shall, with respect to its illuminating power at the distance aforesaid, be such as to produce from a bat's-wing or fishtail burner consuming 5 feet of gas per hour, a light equal in intensity to 20 such sperm candles; and each such gas shall, with respect to its purity, be so far free from ammonia and sulphuretted hydrogen, that it shall not discolour either turmeric paper or paper imbued with acetate or carbonate of lead, when those tests are exposed to a current of gas issuing for one minute under a pressure of five-tenths of an inch of water, and shall not contain more than 20 grains of sulphur in any form in 100 cubic feet of gas: provided that any gas company, and the local authorities of the district supplied by such company, shall be at liberty to agree upon any other or different test by which to ascertain the purity of the gas, or to vary the amounts of ammonia or sulphur in any form hereinbefore allowed, and thereupon the company shall be thenceforth liable to have the purity of their gas tested in the manner so prescribed.

"*Appeal by Consumers to Home Secretary on Rise of Price of Gas.*

"XL. No company shall advance the price of gas above the rate taken by such company, on the 1st day of January, 1860, whenever such rate is at or above 4s. 6d. per 1000 cubic feet, unless there has been such increase in the cost of gas, or any other circumstances affecting the company, as will warrant such advance: provided always, that before raising the gas-rate in any district the gas company supplying such district shall give notice of their intention to the local authorities of the district, and in some newspaper circulating within the district for two consecutive weeks at least one month before such alteration in the gas-rate shall be made; and in case any local authority shall, within such month, dissent from such alteration, it shall be determined by arbitration in the manner hereinbefore mentioned whether such alteration shall be allowed: provided always, that no gas company shall charge for common gas supplied by them any sum exceeding 5s. 6d. for every 1000 cubic feet, or for cannel gas any sum exceeding 7s. 6d. for every 1000 cubic feet: provided also that any company shall be at liberty to change the kind of gas from time to time supplied by such company, whether common or cannel gas, on giving three months notice of their intention so to do; and upon the expiration of such notice the company shall thenceforth supply gas pursuant thereto under the provisions of this Act until any like notice shall be given for a further change; and when the company shall change the supply from cannel gas to common gas, the rate shall be reduced so as not to exceed 4s. 6d. per 1000 cubic feet, except under the circumstances and in the manner hereinbefore set forth."

The principal effect of the Act of 1860, in applying the Act of 1847 to all those companies to which it had not been already applied, was to call into existence, as regarded those companies, the following provisions, viz.:—

"*Profits of the Company limited.*

"XXX. The profits of the undertaking to be divided amongst the undertakers in any year shall not exceed the prescribed rate, or where no rate is prescribed they shall not exceed the rate of £10 in the £100 by the year on the paid-up capital in the undertaking, which in such case shall be deemed the prescribed rate, unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said yearly rate.

"*If Profits exceed the Amount limited. Excess to be Invested and form a Reserve-Fund.*

"XXXI. If the clear profits of the undertaking in any year amount to a larger sum than is sufficient, after making up the deficiency in the dividends of any previous year as aforesaid, to make a dividend at the prescribed rate, the excess beyond the sum necessary for such purpose shall from time to time be invested in Government or other securities; and the dividends and interest arising from such securities shall also be invested in the same or like securities, in order that the same may accumulate at compound interest, until the fund so formed amounts to the prescribed sum, or if no sum be prescribed, a sum equal to one-tenth of the nominal capital of the undertakers, which sum shall form a reserved fund to answer any deficiency which may at any time happen in the amount of divisible profits, or to meet any extraordinary claim or demand which may at any time arise against the undertakers; and if such fund be at any time reduced, it may thereafter be again restored to the said sum, and so from time to time as often as such reduction shall happen.

"*Reserved Fund not to be resorted to unless to meet an Extraordinary Claim.*

"XXXII. Provided always, that no sum of money shall be taken from the said fund for the purpose of meeting any extraordinary claim, unless it be first certified in England or Ireland by two justices, and in Scotland by the sheriff, that the sum so proposed to be taken is required for the purpose of meeting an extraordinary claim within the meaning of this or the special Act.

"*When Fund amounts to prescribed Sum, Interest to be applied to Purposes of the Undertaking.*

"XXXIII. When such fund shall, by accumulation or otherwise, amount to the prescribed sum, or one-tenth of the nominal capital of the company, as the case may be, the interest and dividends thereon shall no longer be invested, but shall be applied to any of the general purposes of the undertaking to which the profits thereof are applicable.

"*If Profits are less than the Prescribed Rate, a Sum may be taken from the Reserved Fund to supply Deficiency.*

"XXXIV. If in any year the profits of the undertaking divisible amongst the undertakers shall not amount to the prescribed rate, such a sum may be taken from the reserved fund as, with the actual divisible profits of such year, will enable the undertakers to make a dividend of the amount aforesaid, and so from time to time as often as the occasion shall require.

"*If Profits are more than the Amount prescribed, a Rateable Reduction to be made in the Price of Gas.*

"XXXV. In England or Ireland the Court of Quarter Sessions, and in Scotland the sheriff, may, on the petition of any two gas ratepayers within the limits of the special Act, nominate and appoint some accountant or other competent person, not being a proprietor of any gas-works, to examine and ascertain, at the expense of the undertakers (the amount of such expense to be determined by the said court or sheriff), the actual state and condition of the concerns of the undertakers, and to make report thereof to the said court at the then present or some following sessions or to the sheriff; and the said court or sheriff may examine any witnesses upon oath touching the truth of the said accounts, and the matters therein referred to; and

if it thereupon appear to the said court or sheriff that the profits of the undertakers for the preceding year have exceeded the prescribed rate, the undertakers shall, in case the whole of the said reserved fund has been and then remains invested as aforesaid, and in case dividends to the amount hereinbefore limited have been paid, make such a rateable reduction in the rate for gas to be furnished by them as in the judgment of the said court or sheriff shall be proper, but so as such rates, when reduced, shall ensure to the undertakers (regard being had to the amount of profit before received) a profit as near as may be to the prescribed rate.

"*Court may order Petitioner to pay Costs of Groundless Petition.*

"XXXVI. Provided always, that if, in the case of any petition so presented, it appear to the said court or sheriff that there was no sufficient ground for presenting the same, the said court or sheriff may, if they or he think fit, order the petitioner to pay the whole or any part of the costs of or incident to such petition (the amount thereof to be determined by the said court or sheriff), and the costs so ordered to be paid shall be recoverable in the same way as damages are recoverable under this or the special Act.

"*Penalty on Undertakers for Refusing to Produce Books, Vouchers, &c.*

"XXXVII. If the undertakers shall, for seven days after being required to produce to the said court or sheriff, or to the said accountant or other person as aforesaid, any books of account or other books, bills, receipts, vouchers, or papers relating to the pecuniary affairs of the undertakers, refuse or neglect to produce such books, bills, receipts, vouchers, or papers, they shall forfeit the sum of £100 for every such refusal or wilful neglect, and the further sum of £10 for every day such refusal or wilful neglect shall continue after the expiration of the said seven days, such respective penalties to be recovered by any person who will sue for the same, with full costs of suit, in any of the superior courts."

The Act of 1860 also contains provisions, intended for the benefit of the consumer, which are chiefly these—viz., provisions for compelling each company to supply gas within its district, for limiting the amount of impurity, and for securing the publication of the accounts of the companies; but the machinery by which the right of the consumer to the utmost economy of manufacture, and to the other advantages of statutory regulation, is to be secured, is either very insufficient, or altogether wanting, in the Act of 1860.

The supply of gas to the metropolis, then, is at present regulated by the combined operation of the Acts of 1847 and of 1860, and is in the hands of thirteen companies; and in order to a complete understanding of the questions which have been principally discussed before your committee, it is necessary to bring into view the claims respectively put forward by the companies on one side, and by the Metropolitan Board of Works and the corporation of London, representing the consumers, on the other. The companies contend that, under the operation of these Statutes they are entitled to what they call a "statutory" dividend of 10 per cent. upon the larger portion of their capital, giving to the public the benefit of any surplus over that amount; on the other hand, the corporation of London, having unsuccessfully prosecuted, in the session of 1866, a bill of their own, by which they proposed to raise capital on the security of the revenues of the City, and to furnish gas of 18 candles power, at the price of 3s. per 1000 feet, contended that the companies, if they retain the right of supplying the metropolis, should be required to furnish gas of the last-mentioned quality at a price not exceeding 3s. 6d. per 1000 feet. The Metropolitan Board of Works also appeared, and, in conjunction with the City, represented before your committee the interests of the consumer.

The committee of 1866, to which the bill of the City was referred, with an instruction to inquire into the operation and results of the Act of 1860, among other things, recommended, "that the system of districts should be continued, and with a view to the economy of administration and the convenience of the consumers and of the public, that every facility should be afforded by Parliament for the further extension of the system of regulated monopoly, either in the way of the amalgamation of the several existing companies, or of the disposal of the interests of the several companies in the metropolis to some body or bodies representing the ratepayers of the metropolis, on such terms and conditions as may be agreed upon, and as Parliament may see fit to impose."

But no bills have been referred to your committee, either for the amalgamation of the existing companies, or for the disposal of their interest to any body or bodies of persons representing the ratepayers of the metropolis.

The bill of 1867 in its original form, as it was read a first time in the House of Commons, contemplated, among other things—

1. The repeal of the second section of the Act of 1860, before set out in this report, with reference to the amount of profit and the rate of dividend.

2. The constitution of a metropolitan gas board, who should from time to time prescribe and certify the mode of testing and recording the illuminating power and purity of gas supplied by the companies, fixing the maximum price at 3s. 6d. per 1000 cubic feet of 14-candle gas, but limiting the dividend to 7 per cent. per annum where that price was charged, with a sliding-scale for an increased dividend where the rate charged was below the maximum price, with a power for the Metropolitan Board of Works, or the Commissioners of Sewers, from time to time to enter into agreements for the purchase of the undertaking of any company.

But these proposals led to a strenuous opposition, and having been referred *pro formâ* to a committee of the whole House, the bill was ultimately sent to your committee, with the clause for the repeal of section 2 of the Act of 1860, as regarded the company's rate of dividend, struck out—with blanks left in the bill for both the maximum price and illuminating power of gas to be supplied by the companies—and with powers for the Board of Trade from time to time to increase or diminish the illuminating power when an increase or diminution in the cost of the production of gas was shown to their satisfaction; and the clauses authorizing the Metropolitan Board of Works, or Commissioners of Sewers, to enter into agreements for the purchase of the undertakings of the companies were omitted.

The Board of Trade appeared as the party promoting the bill in this form. But the counsel of that board made in the first instance no proposals to the committee with a view of filling up the blanks, and the nature and extent of the proposals for that purpose really constituted the principal question in dispute. The case of the consumer, therefore, was brought before the committee by the counsel and witnesses of the Metropolitan Board of Works and of the Corporation of London. But these bodies only appeared as petitioners against the bill promoted by the Board of Trade, and not as promoters of any bill or bills for furnishing to the consumer a supply independent of that furnished by the companies. This position of the parties necessarily raised the question, "Whether your committee was prepared to recommend the adoption of a bill compelling the companies to supply the consumer on other terms than those on which they have been authorized by Parliament to raise, and have actually raised, the capital they employ." To this question your committee could only return one answer. However evident, and however great, may be the advantages of a single supply, under conditions securing to the consumer all that he is entitled to, as regards the quality and price of the article supplied, yet a compulsory and unconditional interference with the prices already conceded to the producer, is not the weapon by which Parliament is accustomed to secure the rights of the consumer. The legitimate weapon to be resorted to for that purpose is the enactment of an independent supply; and to that weapon your committee, for the reasons already stated, have been unable to resort.

Moreover, it appeared from what passed on the second reading of the bill, and from papers which have been already printed for the House, that before the second reading of the bill communications had passed between the President of the Board of Trade and the companies, from which communications it resulted that the board was bound to proceed with the bill only upon certain terms; and in answer to an appeal from the counsel of the companies, the counsel of the board thus expressed the result of those communications to the committee—viz., that the board was bound not to proceed with the bill unless the 10 per cent. were retained on the same basis and on the same terms as they appear in clause 30 of the Act of 1847.

With powers so limited by the circumstances under which the measure was proposed, your committee proceeded to consider "whether, and on what terms, the right of exclusive supply ought for the future to be retained by the companies."

It appears to your committee that the advantages of a system of exclusive supply are great and obvious, if accompanied by conditions securing the consumer against the evils to which monopoly, unrestrained by sufficient regulations, is calculated to give rise. These advantages involve many considerations of public convenience and of economy; and in the hope of arriving at an arrangement by which the claims of the companies might ultimately be reconciled with the just expectations of the consumer, your committee entered upon a protracted investigation, in the course of which they received much conflicting testimony, which will be found appended to this report. The result of this testimony, and of the documentary evidence by which it was accompanied, has been to convince your committee that the Act of 1860, and the arrangements which it sanctions, have been eminently favourable to the companies, while the interests of the consumer have been very inadequately protected. It appears that while the companies generally under the system of competition paid moderate dividends, under the new arrangements every company has paid, with rare exceptions, the maximum allowed by the Act of 1847; and that in many cases large sums have been paid besides, in the name of back dividends, to make up for back dividends which, under the former system, had fallen short of the maximum.

The total capital of the companies, as shown by a return put in by them, is at present £6,835,539, and the annual amount required to pay interest on loans, and what is called the "statutory" dividend on shares, is £605,156. The total quantity of gas sold in 1866 was 8,653,517 cubic feet; and upon the assumption that the general price of 4s. was the universal price (which is not quite the case, since some of the companies supply a better gas at a higher price, and two companies are charging only 3s. 4d.) the amount received would be £1,730,705. The quantity sold increases annually at a rate of from 5 to 10 per cent. upon each preceding year; and it is evident that if, by improved administration and economy, the increased supply can be furnished to the public without a proportionately increased expenditure of capital, a lower price per 1000 feet will realize to the shareholder an undiminished dividend. How rapidly this process sometimes operates may be collected from the following paper put in by the Western Company:—

Metropolis Gas Bill, 1867.—*Western Company.*

	December 1856 (before districting).	December 1866.	Difference per cent.
Share and loan capital, per £100 income.	£531 9 0	£317 9 0	40·2
The same, per £100 gas-rental	608 7 0	364 8 0	40·
The same, per million feet made	1610 0 0	842 0 0	47·7
The same, per ton of coal	13 3 0	7 8 0	41·3
	Cubic feet.	*Cubic feet.*	
Gas made	138,000,000 (nearly)	410,000,000 (nearly)	197·
Total income	£41,754	£108,651	160·
Number of consumers	4779	11,700	144 p. ct.
Amount required for dividend and interest per 1000 feet of gas made	35·04d.	18·36d.	47·6

The effect of the system of exclusive supply upon the interest of the companies may be further illustrated by the remark that two companies—the Independent and the South Metropolitan—now furnish gas to the consumer at 3s. 4d. per 1000 feet of 14-candle gas; and that their comparative prosperity was thus accounted for to the committee of 1866 by the solicitor to the companies, viz.:—

"The benefit to the public is when the companies are paying their full dividends, and a reserved fund is formed; every further outlay of capital brings a much larger profit, and the reduction of the price of gas becomes more rapid. Take the instance of two companies observed upon in this committee—the Independent and the South Metropolitan: they are furnishing gas at 3s. 4d. instead of 4s.—why is it? By an arrangement they were able to get a district of their own five years before the other companies, therefore they have sooner come to their maximum dividend; they have sooner put by their reserve-fund, and can sooner and more rapidly reduce the price of gas. If the gas companies are allowed to go on, you will find the price of gas coming down every year by the accumulation of profits on the sale of gas. The committee must be aware that the quantity of gas issued in London is very large; the quantity supplied to the large district of the Imperial is doubled every 10 years."

It is evident, even from the most cursory reference to the map of the gas districts, that the present arrangements fail to afford to the companies and to the consumer the greatest attainable advantages of economical manufacture and distribution.

In the analysis of their accounts furnished by themselves the companies divide their expenditure, exclusive of the sum paid in dividends and interest, into two general heads—viz., first, fuel; and, secondly, general charges. If we examine the first—viz., fuel—we shall find that the different companies appear to be very differently circumstanced in this respect; insomuch, that of the eight companies which supply common gas exclusively, comparing in each case the highest with the lowest, the Commercial paid, in 1866, 17s. 4·81d. per ton for coal, while the Surrey Consumers paid only 15s. 1·19d.; and for the same year the Phœnix realized for its residual products 9s. 0·21d., while the Imperial realized only 6s. 8·18d.; and the net difference, after allowing for the sale of the residual products, between the South Metropolitan, which obtained its fuel upon the most advantageous terms, and the Commercial, which obtained it upon the least advantageous terms, was as follows, viz.:—

Commercial	10s.	5·72d. per ton.
South Metropolitan	6	6·08 „
Difference	3s.	11·64d. per ton.

This, it will be observed, shows an excess of more than 50 per cent. in the expenditure of the Commercial Company for fuel over that of the South Metropolitan.

Again, if we examine in detail the items which are included under the head of "general charges," we shall find in the appendix to the report of the committee of 1866 the following table put in on the part of the consumer, and framed from calculations made by Mr. Hughes, viz.:—

TABLE *showing Expenditure per* 1000 *Feet of Gas sold by each of the London Companies supplying Gas to the Metropolis in the Year* 1864.

	Directors and Auditors.	Salaries and Commission to Collectors.	Rates and Taxes.	Stationery, Law Chrgs., and Incidentals.	Purifying Materials.	Wages and Supervision.	Repairs of Retorts, Works, and Mains.	Restoring and Replacing Meters.	Total.
Imperial	·315	1·860	·915	·690	·480	5·065	7·305	·345	19·273
Chartered	·525	2·205	1·770	·855	·660	6·135	6·180	1·200	19·530
Phœnix	·705	1·515	1·485	1·095	·555	7 695	6·780	·945	20·775
London	·555	1·965	1·635	1·125	·435	6·615	13·320	1·155	26·805
Commercial . . .	·705	1·530	1·425	1·125	1·200	7·380	4·410	·330	18·105
City of London . .	·795	1·125	1·035	1·080	·330	7·995	7·500	1·290	21·150
Great Central . . .	·975	1·395	1·005	5·070	·360	6·855	6·285	·645	22·590
Independent . . .	·915	1·575	·915	1·305	·480	8·700	3·075	1·275	18·240
South Metropolitan .	·780	1·935	1·275	·945	·465	8·370	4·830	2·055	20 655
Equitable	1·080	2·055	1·065	·615	·765	4·920	6·405	·585	17·490
Surrey Consumers .	1·305	1·350	1·470	·885	·570	8·400	4·365	·390	18·735
Ratcliff	1·260	1 635	1·635	·960	·660	8·715	4·740	·015	19·620
Western.	1·315	2·850	1·014	1·068	·274	8·069	3·233	·644	18·467

From this table it results that if the highest expenditure in each case be contrasted with the lowest—

The charge for directors appeared .	Imperial	0·315	p. 1000 ft.
	Western	1·315	„
Salaries and commissions . . .	City .	1·125	„
	Western	2·850	„
Wages, &c.	Equitable	4 920	„
	Ratcliff	8·715	„

It does not necessarily follow from these contrasted figures that in all cases the more economical result is due to the superior management of the company by which it is attained, or that the blame of wasteful expenditure must be attributed to companies in respect of which the calculation exhibits a less satisfactory result. But it has appeared to your committee that a strong inference arises from these comparisons in favour of the conclusion that, by a judicious amalgamation of these thirteen companies into one or at least into a very reduced number of companies, and an adequate control over the expenditure, great economy might result, of which the consumer might have the advantage without prejudice to the dividend earned by the producer. It certainly cannot be expected that the consumer, however willing to give credit to the companies for the upright and efficient management of their affairs, will be satisfied with a system under which no one appears to have an over-ruling interest in reducing the aggregate expenditure to a minimum except himself, and under which no one who represents his interest has any share in or control over the direction of that expenditure. It is evident also that, among the many advantages which would result from a just and satisfactory settlement of the question, would be the power of raising in future by loan, instead of by shares, a considerable proportion of the whole capital employed in the production and distribution of gas, and thus of diminishing the proportionate amount required for dividend.

Particulars of the price and power prescribed in the Acts of companies in various parts of the country, as compared with those of the London companies, of the prices actually charged, and of the prices of coal in the respective places, will be found in the appendix. A reference to that account will give a better guide to the formation of a just opinion than a brief analysis of a subject involving so many and so various details of difference.

At the close of the companies case, their counsel insisted that 10 per cent. should be (referring to the Act of 1847) the "prescribed" rate, and that there should be a price and an illuminating power fixed in the bill which fulfilled that condition; but made an offer to accept a maximum price reduced from 4s. 6d., as enacted in 1860, to 4s., and a minimum illuminating power raised from 12 to 14 candles. But this, though an improvement as regarded the provisions of the Statute, would have been little or no concession if compared with the supply already actually enjoyed by the consumer, since no company is now charging more for common gas than 4s., whilst the Independent and South Metropolitan charge only 3s. 4d.; and it must be acknowledged in favour of the companies that the quality supplied appears to be in general fully equal to 14 candles.

Having, then, heard the case of the companies as well as that of the consumers, your committee adopted and communicated to the parties the following resolutions, viz.:—

"1. That the supply of gas in London ought to be controlled in favour of the consumer, either by the means of an effective competition, or, if the system of an exclusive supply be maintained, by the means of effective regulation.

"2 That neither of these conditions is adequately fulfilled by the system of exclusive supply now in operation under the arrangement sanctioned by the Act of 1860.

"3. That no bills for the establishment of a competing supply having been referred to the committee, the question of providing for the establishment of control by the means of competition does not immediately arise.

"4. That the committee regard the establishment of a due control, by an amendment of the Act of 1860, upon the system of exclusive supply, as preferable to the future introduction of competing works, and are prepared to settle the present bill accordingly, if that course be consented to by the parties.

"5. That the extensive powers asked for by the Chartered Company and by the Imperial Company respectively, in the bills now before the committee, are calculated to throw obstacles in the way of future competition, and that the committee are not prepared to entertain them until the general system of supply shall have been first placed upon a more satisfactory basis.

"6. That the settlement must provide for the improved administration of the system by reduced expenditure; and the committee think that, by the amalgamation of some of the companies, and improved arrangements of the districts, that object may be easily attained.

These resolutions led to the following proposals from the companies, viz.:

"The committee of chairmen of the metropolitan gas companies having taken into consideration the resolutions of the select committee of the 3rd instant, and the views of the committee as expressed in explanation, resolved—That the companies are prepared to repeat their proposition of 14 candles and 4s. price for common gas. But as they have now a twelve months experience of the effects of this price, and find they can scarcely maintain under it the parliamentary dividend, they feel it impossible to adopt any lower rate until the progress of consumption shall enable them to do so consistently with the maintenance of the statutory dividend. That in order to meet the views of the committee, and evince their readiness to adopt every practicable plan to reduce to their minimum the working expenses, the committee (*i. e.*, of chairmen) are prepared to effect amalgamations amongst their various companies, and suggest a rearrangement of the districts of supply, so as to make generally available every source possessed by individual companies, and avoid to the utmost practicable extent the outlay of capital required for increased supply. That the public may be secured in the benefit of any reduction of working expenses thus arising under the provisions of 'The Gas-Works Clauses Act, 1847,' the companies are prepared to recognise the appointment of a public auditor, in the place of the accountants by that Act proposed to be occasionally appointed; so that the extent to which reduction may proceed, consistently with the maintenance of the dividend, and the fairness and accuracy of the companies accounts, may be placed beyond dispute."

Upon which your committee adopted the following resolutions:—

"1. That the committee are not satisfied with the offer made on the part of the companies to supply gas to the metropolis at the price of 4s., with an illuminating power of 14 candles.

"2. That they are prepared, with the consent of the parties, to insert in the present bill a price which, after making adequate allowance for reduced expenditure, shall be calculated to yield, with due care and management, a dividend attaining, or at least approaching, the maximum dividend of the Act of 1847, upon the amount of the share capital already expended under the authority of Parliament. In this case they will insert also in the bill machinery for the periodical revision of the price in conformity with this principle.

"3. Failing the acceptance of these proposals, the committee will report to the House their opinion that powers for the supply of gas ought to be conceded to the local authorities of the metropolis."

Upon the receipt of these resolutions, and in compliance with an invitation from the committee, the counsel for the Board of Trade communicated with the counsel of the companies, and eventually proposed an arrangement by which the price of common gas was to be reduced from the 1st of January, 1869, to 3s. 9d., and the illuminating power to be raised from 14 to 16 candles; with provision for a scheme of amalgamation to be carried into effect under the direction of the Board of Trade. Provision was also to be made for a periodical revision of the price and illuminating power whenever, from the increase of consumption, and the improved administration of the works under the new arrangement, it should be necessary to revise them in order to secure terms which should, from time to time, be fair to the shareholders, and also just to the consumer. The plan included audit of accounts, inspection of works, and periodical arbitration under the control of the Board of Trade.

It was urged by the Metropolitan Board of Works that, as terms of compromise, the price of 3s. 9d. for 16 candles might be adopted for three years, after which time the price should fall to 3s. 6d., subject to an arbitration, in case it should be alleged by the companies that the cost of coal, wages, &c., had increased in the interval. But your committee considered that as the price of gas has always hitherto steadily decreased from one interval of time to another, and the annual increase of consumption is considerable, the plan of periodical revision was one which might have been adopted with great mutual advantage, both to the consumer and the companies. They think that with an amalgamation of the companies, and an effective supervision, the proposal for an arbitration which should give to the consumer the prospect of reaping periodically the full benefit of improved administration and increased consumption, by a ready means under the control of a public department, is more advantageous to the consumer, as well as more just to the companies, than the proposal of the Metropolitan Board of Works to enact a fixed price of 3s. 6d. after the lapse of three years, from the 1st of January, 1869, without any provision for future reduction in price, or increase of illuminating power.

Under these circumstances, the propriety of adopting the proposed plan mainly depended upon the question whether your committee were satisfied with the terms of the clause which was to direct the proceedings of the future arbitrators. It had been explained to the parties that your committee intended the price to be, from time to time, so calculated as to yield the maximum dividend, if the companies exercised due care and management. but not to guarantee that dividend irrespective of such care and management; and the clause was submitted to your committee by the counsel of the Board of Trade, in the following words, viz.:—

"1. They (*i. e.*, the proposed arbitrators) shall fix such an illuminating power and such a price as shall be calculated to yield to the company, with due care and management, a dividend in that year (after allowing for the excess or surplus, if any, carried in the then last preceding year to the credit of the divisible profits of the company) attaining, or at least approaching, the rate of £10 per centum per annum, and to make up any deficiency of their dividend in the then last preceding year authorised by this Act to be made up."

This clause was opposed by the companies, on the ground that the expression "or at least approaching" was not sufficiently explicit, and did not give them statutory dividend. The whole clause was also opposed by the counsel for the Metropolitan Board and the City, on the ground that it amounted to a guarantee of that statutory dividend.

Your committee modified the clause by substituting the words "as near as may be" for "or at least approaching," but they struck out the last sentence, viz.:—"To make up any deficiency of their dividend in the then

last preceding year authorized by this Act to be made up," and the clause as amended, stood as follows, viz.:—

"They shall fix such an illuminating power and such a price as shall be calculated to yield to the company, with due care and management, a dividend in that year (after allowing for the excess or surplus, if any, carried in the then last preceding year to the credit of the divisible profits of the company) attaining, as near as may be, but in no case exceeding, the rate of £10 per centum per annum."

Upon which, the counsel for the companies dissenting, the further progress of the bill became impossible.

Your committee do not recognise as just the construction which the companies appear to place upon the combined operation of the two Acts of 1847 and 1860. When the Act of 1847 was passed, it was intended for the regulation, not of 13 companies in London acting upon an exclusive system, but for the regulation of all the companies which might be established throughout the country, and which in general would be subject not only to the limit of the Act in respect of dividend, but also to the competition of other companies in the same districts. When the Act of 1860 was passed, the metropolitan companies had not generally attained the limit of 10 per cent.; and the possibility of that limitation being interpreted to convey a right to a "statutory" dividend of 10 per cent. may not have been as clearly understood as from recent experience and discussion is now the case. This view has, however, been very distinctly presented to your committee in the course of the present inquiry, and while they do not feel themselves at liberty, as they have already said, to interfere with the enactments of the year 1860 in that respect, without the consent of the companies, they do feel bound to be careful that they do not in any way strengthen, by any proceeding of their own, what they consider to be a departure from the intention with which the limit of 10 per cent. was originally prescribed by Parliament. Substituting in the case of the metropolis effective regulation for that competition which they believe was contemplated by Parliament when the Act of 1847 was passed, they think that justice will be done between the consumer on the one side, and those who have invested their capital on the faith of the legislation of 1860 on the other, if in any future arrangement a price be fixed which will afford to the companies a reasonable prospect of attaining from time to time, with due care and management, the maximum dividend of the Act upon the share capital which has been already expended under the authority of Parliament; but that the stimulus to due care and management will be unduly weakened if they are enabled to make good the deficiency of one year's dividend by the surplus of another.

The reduction of price under the bill, as it would have stood if the companies had accepted the decision of the committee, would have been, as compared with the prices of the Act of 1860, from 4s. 6d. for 12 candles, or 4½d. per candle, to 3s. 9d. for 16 candles, or about 2¾d. per candle; if compared with the actual prices now charged by the companies (excepting the South Metropolitan and Independent), viz., 4s. for 14 candles, a reduction from 3½d. to 2¾d. nearly. The 3s. 9d. for 16 candles proposed by the Board of Trade may be considered as nearly equivalent to the 3s. 4d. charged by the two last-mentioned companies for 14 candles. Besides this reduction, provision would have been made for improved administration and reduced expenditure by the amalgamation of the companies, for an efficient audit of the accounts, for an effective supervision of the working and expenditure, for the abolition of the system of back dividends, and for the payment of penalties out of the sum divisible among the shareholders. The advantages to result from these various amendments of the Act of 1860 would have been secured to the consumer by a periodical revision of price, through the agency of arbitrators appointed by the Board of Trade; and the purity of the gas would have been ensured by a system of administration under the superintendence of the same board. To these advantages your committee consider that the consumer is entitled; and they recommend that nothing less should be required as the conditions of any settlement which may leave in the hands of the companies exclusively the future supply of the metropolis.

Two private bills were referred to your committee, one promoted by the Gaslight and Coke Company, commonly known as the Chartered Company, which provided for the compulsory purchase of land at Barking, in the county of Essex, to the extent of 150 acres, and the raising a new capital of £1,127,500; and the other promoted by the Imperial Company, which provided for the compulsory purchase of land in the parishes of West Ham, Hammersmith, and Acton, and the raising a new capital of £1,218,750.

These two bills your committee were prepared to entertain, if the companies promoting them had agreed to incorporate the conditions which your committee had adopted as proper to be applied to the companies generally; but the two companies declined to do so, and the bills have accordingly been rejected by your committee.

The Chartered Company further proposed to write up as capital, henceforward to be entitled to dividend at 5 per cent., the sum of £360,000 in respect of sums at various times, during the period of competition, derived from revenue, and applied to purposes of capital expenditure. Your committee, without hesitation, rejected this proposal.

The Imperial Company represented that without additional works, such as were provided for by their bill, they would be in the winter of 1869-70 unable to fulfil the obligations imposed upon them by the Act of 1860, and would consequently be exposed to penalties under the Act, while the consumer would at the same time be exposed to inconveniences against which the Act was intended to protect him by the enactment of those penalties. But the Metropolitan Board of Works, as representing the consumer, opposed the bill, and your committee declined to modify what they considered the reasonable terms on which alone they were prepared to entertain the case of the Imperial Company.

In conclusion, therefore, your committee have now to repeat the expression of their decided opinion that, either by the way of regulation or by the way of an independent supply, the consumer is entitled to a far more efficient control than he at present enjoys with respect to the supply of gas to the metropolis. The difficulty with which your committee have had to contend will be found to apply to every general bill which may be introduced without the concurrence of the companies for the regulation of their present monopoly. But it will always be in the power of Parliament to prescribe terms of regulation as each company comes before it to apply for new powers, and the necessity for new powers has usually brought the companies to Parliament at no long intervals of time. Your committee, however, do not think it would be just to the consumer to leave him to the casualties of this mode of remedy, and recommend that if the companies decline to submit to general regulations, such as Parliament may consider reasonable, measures should be taken for the introduction of a new supply in independent hands.

It is evident from the nature of the case that the possibility of introducing competition in respect of gas is qualified by circumstances which restrain it within even narrower limits than those which apply to other large incorporated undertakings. The difficulty of finding room for mains and service-pipes in the already crowded line of the streets, the public inconvenience of frequently disturbing the pavement, the objections usually entertained by the inhabitants of populous districts to the introduction of new gas-works, &c.; all are obstacles in addition to those which are connected with the raising of the capital required for so great an undertaking as that of supplying with gas any large portion of the metropolis.

It seems to your committee, therefore, that the consumer cannot rely upon the probable introduction of new companies in competition with the powerful organization whose existence has been confirmed by the Act of 1860; and that if the consent of the companies to a proper amendment of that Act cannot be obtained, the proper remedy will be for Parliament to concede to the City of London, the Metropolitan Board of Works, or other local authorities of the respective districts, the power of supplying those districts in the manner in which the corporation of Manchester supplies that city and the surrounding neighbourhood.

If it shall be urged on the part of the companies that it would be hard to compel them to compete with a public authority, the sufficient answer, in the judgment of your committee, will be that they have brought the competition upon themselves by rejecting reasonable terms, and that it would be unjust to the consumer that he should continue subject to monopoly, and not be provided with the safeguard of effective regulation.

Your committee consider that the main cause of the failure of legislation which has taken place in the present year has been the absence of any bills authorizing the establishment of an independent supply of gas in the hands of the local authorities. They recommend that unless terms satisfactory for the consumer can be arranged with the companies, the Board of Trade should abstain from the introduction of any other measure like the Metropolis Gas Bill, 1867. What terms would, in the judgment of your committee, be satisfactory for the consumer, has already sufficiently appeared in an earlier part of this report. Unless the companies are prepared during the recess to consent to such an arrangement, your committee think that every facility should be afforded to the local authorities of the metropolis, in the session of 1868, for the introduction of an independent supply.

Aug. 8, 1867.

HOUSE OF COMMONS.

METROPOLIS WATER SUPPLY.

NINTH DAY—MONDAY, JUNE 3.

(*Continued from page* 716.)

Dr. *Henry Letheby*, examined by Mr. CLERK.

I am the professor of chemistry in the college of the London Hospital, and medical officer of health of the City of London, and have been extensively engaged in inquiries with regard to the character of water for the supply of most of the large towns in England ever since the year 1854. At the request of the Metropolitan Association of Medical Officers of Health, I have been making analyses of all the metropolitan waters every month. In some instances they have been duplicate analyses. The form produced shows the month during which the examination was made, the total quantity of solid matter per gallon, the loss by ignition, the oxidizable organic matter according to the formula which I have adopted, and the hardness of the water before and after boiling. The return includes the five Thames companies, the New River, the East London, and the Kent companies. Dr. Odling, professor of chemistry at St. Bartholomew's Hospital, and Mr. Abel, the eminent chemist to the War Department, at Woolwich, have, with myself, been very carefully and closely investigating all the circumstances connected with the quality and quantity of the water supply. I have inspected the systems of purification of all the different companies, and also the process of filtration. We took samples of the water as it entered the works of the several companies, and also water from the public mains, which represent the quality as supplied to the public. We took them from the mains at the cab-stands for the most part. The first of the tables produced represents the general properties of those waters in their several conditions. The Kent Company is not included. The general results are expressed in a small table at the bottom. It shows that the proportion of solid matter in the unfiltered water is greater than that of solid matter in the filtered water, quite irrespective of the suspended matter. It shows, also, that the organic matter, as determined by incineration, is less in the filtered water than in unfiltered water. It shows that the hardness is less in the filtered than in the unfiltered; and the general conclusion is that filtration removes other things from the water than suspended matter, that it oxidizes to some extent the organic matter, and precipitates, or rather takes up, a certain proportion of the earthy carbonates dissolved in the water. In the case of the Thames companies, before filtration the hardness of the water is nearly 14½°, and after filtration, 13·3°; the New River, before filtration, 15½°, after, 13½°; the East London, unfiltered, is 14·4°, filtered, 14°. The samples are average examinations, inasmuch as they were not all taken on the same day. The Kent water is not filtered; it is drawn from the wells, and sent directly to the mains. It is hard water, but it is not filtered. It would not become softer to any great extent by filtration. It might in the same proportion as the New River; perhaps the degree of hardness might be lessened by filtration. It is not necessary to filter water drawn from chalk wells for the purpose of removing organic matter. The table produced shows the amount of organic matter which is removed from the water by filtration—organic matter being determined by the usual process of incineration of the solid residue—and it shows this, that in the case of the Thames water the organic matter is reduced from about 1·26 grain per gallon to 0·97; that in the case of the New River water it is reduced from about 7-10ths of a grain per gallon to rather less than 6-10ths of a grain; and in the case of the East London water, from 9-10ths to 3-10ths of a grain. That is determined by incineration. We have also the results, in table No. 1, of boiling upon those several descriptions of water as affecting the degrees of hardness. The Thames waters are reduced from 13° of hardness, which is their state after filtration, to from 5·3° to 4·6°. Taking the average, the primitive hardness of this water is 13·3°, and the hardness after boiling for a quarter of an hour is 4·6; East London water is reduced from 14° to 5°, and the New River from 13½° to 4°; so that it may be said that, upon the average, a quarter of an hour's boiling brings down all those waters to about between 4° and 5° of hardness. The results in table No. 1 establish that the water supplied by all those companies is a well aerated water. We have determined the proportion of gases dissolved per gallon in each of those waters, and the proportions range from about 12½ cubic inches per gallon up to nearly 15. That gas consists to a very large extent of oxygen—about 15 per cent., or from that to 19 per cent. That is an excessive quantity. The organic matter that is capable of oxidation, as determined by the permanganate test, requires only, on the average, in the case of the Thames

water, about one-tenth of a grain, or rather more; whereas the quantity of oxygen dissolved in the water, and capable of oxidizing that organic matter, ranges from seven-tenths to nine-tenths of a grain; you have, therefore, five times as much oxygen dissolved in the water as is required for the oxidation of the organic matter contained in it. That shows a very well aërated water. The table also shows the quantity of ammonia in grains per gallon. Ammonia is another indication of the quality of water, and we find that the proportion of ammonia per gallon of water is only expressed by a third decimal place; it is 0·003 of a grain. The rain water of rural districts I have found contains considerably more ammonia than that. Water from the clouds contains more ammonia than is found in the water which is supplied to the public in London; and if ammonia be evidence of the existence of putrefying matter, the fact of there being so small a quantity of it in the water supplied to London, would indicate the absence of decomposing organic substances. The rain water of the City contains nearly half a grain of ammonia per gallon. The result of all there analyses is to show that those waters are in themselves good waters. The second table gives the particulars of all the constituents, and the proportions of those constituents, in the water supplied to London, and the result of the examination is, that those constituents are not in excessive quantity—that there is nothing of a hurtful quality about them.

The CHAIRMAN: Do you know what the excess of quantity is in each case of those constituents which would make water unwholesome?

Witness: No; I cannot say what proportion of saline matter would make water unwholesome. We have had evidence that at Carrara water may be drunk in considerable quantity which contained 92 grains of carbonate of lime per gallon, and we have found no evidence at all at the present time as to what proportion of saline matter in water is absolutely unwholesome. Generally speaking, we say, then, that a water containing more than 10 grains of carbonate of lime, or of its equivalent, per gallon—that is to say, water having more than 10° of hardness—is regarded as a hard water; at least, on the side of hardness. I cannot tell at what point it became unwholesome. There is no evidence to justify an opinion upon such a subject. There is no evidence of the water at Tunbridge Wells being unwholesome or unfit to drink in consequence of the presence of lime in it. The attention of everybody who has considered the question of water has been directed to that subject, but as far as I know at the present time, with regard to carbonate of lime, there is no evidence that any quantity that water can take up, or even a sulphate of lime, if such water is used in moderate quantities, will actually injure health. The hardness of water may be due to magnesia to some extent, but it is chiefly due to lime.

Mr. CLERK: With regard to the question of hardness produced by other matters than chalk, are there not salts of iron which make the water very hard?

Witness: Yes, if we were to separate the other saline matters besides the calcareous matters. If we were to take the sulphate of soda, the sulphate of magnesia, or nitrate of potash, or any other saline matters, perhaps we might arrive at the proportion of those which would be injurious; but I am directing my attention at the present moment to the proportion of carbonate of lime.

The CHAIRMAN: Does not a careful examination of the water permanently drunk by poor people, who drink a great quantity of water, enable you to say what quantity of lime in the water becomes injurious to health.

Witness: I cannot tell you that; I can only tell you that the largest quantity that water can take up is 92 grains per gallon, and that is a water which is drunk in considerable quantity without injury to health.

By Mr. CLERK: There would, of course, be some inconvenience in the use of such water as regards hardness for washing purposes, and after some little time, after half an hour's exposure to the air, it becomes milky, and has not a pleasant appearance. Animals, generally speaking, are not fond of water containing carbonate of lime—they will rather drink out of a dirty pool than drink hard water; but I am directing my attention to the effect of such waters upon the human constitution. If we find an excess of salts—chloride of sodium, for example—it is generally a bad indication; but there are exceptions to that rule, because some waters which are in the neighbourhood of the sea-shore contain common salt to the extent of 4 or 5 grains without being injurious, or giving any indication of being polluted; but, when we have common salt in river waters in large quantities, and when we find common salt also in well waters, we are disposed to think that such common salt must have come from the secretions of the human body—the urine in all probability—and it is an indication to some extent of previous pollution. Looking at these waters, we find that the proportion of common salt is very small—it does not amount to 2 grains in any of them. The presence of that quantity can be of no possible harm. Common salt is in itself harmless in those proportions, but it is a tell-tale of the sort of matters which may have got into the stream. From things seen we infer things unseen and unknown. Table No. 3 shows the results of the examination of the waters supplied by the different metropolitan water companies during each month of the years 1865 and 1866. It shows that the variation in the composition of any of the waters is but slight—it does not amount to 2 grains on either side of the average. We have more solids in the water in the months of January, February, November, and December—that is, during the rainy months—than we have in the water during the months of July, August, and September, when there is but little rain; but the average proportion on either side is so small, that it indicates that the waters are not of very variable composition. The fluctuations are pretty nearly the same in each case. The table shows the quantity of solid matter, and also the quantity of organic matter month by month during the year, and also the quantity of oxygen that is required to oxidize organic matter. This raises another issue, upon which there is some difference of opinion amongst chemists. I have another table—No. 4—which shows the qualities of the waters supplied to the metropolis in the years 1851, 1856, and 1867. It shows some improvement between 1853 and 1856, and it has improved also between 1856 and 1857. All the samples were taken in the month of January, therefore they are fairly comparable. The Kent Company is included in that table, and shows the same improvement. That company has more solid matter in the year 1867 than it had in the year 1856; but that is due to this, that they abandoned the river Ravensbourne, and are now taking deep well waters. In all cases the organic matter has been determined by the same process—namely, that of incineration. We have arrived at the result that they will bear comparison with the waters supplied to most of the chief towns in Europe. Table 5 shows that the waters supplied to most of the large towns in England will bear a comparison with most towns in Europe. We have them from very different formations. Birmingham is supplied from the red sandstone. Guildford is chalk water or the green sand; it comes from both. There are different descriptions down to lake waters. We have got the Loch Katrine waters at Glasgow, and a water similar to it on the other side of the Clyde. Some of them have a very small amount of solid matter per gallon, and some are soft waters. We begin with Birmingham, which contains the largest proportion of solid matter per gallon; and we go to Loch Katrine, which contains the smallest proportion; and I have put in the last column the proportion in 1861 of the mortality, for the purpose of getting at this: whether there could be seen any relation whatever between the mortality of a town and its water supply. The result is, that the mortality is less in all the towns supplied with hard water than in any of the towns supplied with soft water. I do not mean to say that this is due to the water at all, but it is an indication that the water has nothing to do with the mortality.

The CHAIRMAN: Have you classified those waters as hard and soft in the table?

Witness: As they go down in degrees of hardness, they pass down in degrees of solid matter, and then you will find under the degrees of hardness, if we take this indication as a sort of datum line, that above 10° may be called a hard water, and below 10° a soft water; you will find that in all the towns supplied with soft water the average mortality amounts to 26·1 per 1000, whereas in the hard water districts it amounts to only 22·2.

The CHAIRMAN: On the other hand the occupations of the people in the towns in that table, and the conditions under which they labour, are not the same?

Witness: I am quite prepared to admit that both Birmingham and Sheffield have pretty nearly the same class of population. You will find Birmingham water to be the hardest in this country; Sheffield is supplied with very soft water, which contains less than 6 grains per gallon. The mortality in Birmingham is 24·4 per 1000, but the mortality in Sheffield is 26·2 per 1000. Those are places quite comparable, but there are other causes. I am not putting that down to the water. To some extent Birmingham is on high ground, and Sheffield on low ground. Birmingham is well situated for drainage and many other circumstances. This table was drawn up for the purpose of getting at this: whether there could be found any relation between the health of towns and their water supply.

By Mr. CLERK: I do not deduce any positive result beyond what may be termed a positive negative result; that is to say, it indicates that whatever it is, it has nothing whatever to do with the health of towns. Taking the average of the towns of England which have water over 10° of hardness, we shall find that the average is 14·9, and that the metropolitan water is 13. The Birmingham water is 15½°; the Leamington and the Guildford water 18½; the Southport water 19½°. The mortality in Southport is only 19 per 1000; that is remarkable, because Southport is a place to which invalids go, and one would imagine that the mortality would be increased on that account. I have not any table of the sources of supply of those different waters. That is a matter to which the engineers could speak better than I can. The Birmingham water is from the red sandstone, and Leamington also; Guildford is from the green sand, and to some extent it contains salts of iron. Edinburgh is peaty water, taken from the hills. Some of those are river water; Wakefield for example. Southport is out of the red sandstone. There is this peculiarity about these waters, that you will find that all hard waters are clear waters and sparkling waters, and pleasant to the taste, whereas, it is the reverse with soft waters, so far as my experience goes. They are not generally bright; they have a peaty tint, and, to my mind, not a pleasant taste.

Mr. CLERK: Looking to that which is the great test of the quality of water—viz., the amount of organic matter—do the London waters compare well with the waters supplied to other large towns?

Witness: Yes. In the waters of over 10° of hardness the organic and other volatile matters are 1·37 grains, and the metropolitan water is 1·18 grains.

Examination continued: I am aware that the question of the advantage of supplying a hard or a soft water to a town has been a good deal considered, both in France and in Austria. A short time since it was referred to a commission of French chemists, to consider whether a hard water or a soft water was best adapted to supply Paris. The commission rejected the soft water, and chose water very similar in its composition to that now supplied to London. I have been examining the Paris waters within the last fortnight, and I find that the new Paris water is very similar to the New River water. That is the water which has been selected by the commission appointed to inquire into the best source of supply for the city of Paris, in preference to a very soft water, which they might have obtained from a granite district. They had selected it because they considered that water supplied to a large city should possess certain qualities which soft water rarely or never possesses. It was from a chalk, just in the same manner as all the water for London comes from chalk. The New River water and the river Lea water are all in reality chalk waters, but they have become softer a little by passing in open channels. The new Paris water is brought from near Chalons-sur-Marne, which is a large chalk district.

By Mr. H. BAILLIE: They use the water from the Seine to some extent. They pump a little at Chaillot, and also just on the opposite side; but they are now little by little abandoning the Seine water, and are taking these chalk waters which are being brought into Paris. In the course of a few years they will have nothing but this chalk water. They expect to obtain a supply of 30 gallons per head.

By Mr. KEKEWICH: They bring some of those waters a very long distance—from between Chalons and Epernay. Then, again, at Vienna there has been a commission to inquire into the best water. I have a report upon that subject. The commissioners have reported in favour of a supply of rather hard water, or water that is not very different from the water that is supplied to this metropolis; and they have reported upon nearly the same ground as the French. They have examined and selected water from 10° to 18° of hardness, and they say that water of 12·6° of hardness is not objectionable, and that it is of prime consideration, in supplying a city which uses the water for drinking purposes, that it should be bright and clear, and well aërated.

By Mr. CLERK: The general characteristics of a hard water, which in my opinion would render it the better adapted for the supply of a town, are these: In the first place, it is generally bright and clear, and well aërated water; it is agreeable to the eye and to the palate. In the next place, it is not supposed to absorb foul gases; it is already so charged with gases that it has little or no tendency to take in other gases. It is not liable to putrefaction, and the organic matter is so small, and is preserved in it to a greater extent than it would be if it were soft water. It has no chemical action upon lead or iron pipes, which is another good property, for although soft waters may not acquire a poisonous property by reason of their being brought into contact with lead, yet we know unquestionably that soft waters do act upon lead; I believe that, to some extent, there is a risk in that respect. Though the waters supplied to London have a primitive hardness of 13½°, yet, when they are raised to the boiling point, the hardness falls to 11·2°; and by boiling the water for five minutes, the hardness is reduced to

9·3°; for a quarter of an hour, to 4·4°; for half an hour, to 2·6°; and for an hour to 2·4°. You will not find in any kitchen boiler in London a water harder than 5° of hardness. Those degrees are tested by what is called Dr. Clark's test. A crust is deposited from time to time from the use of hard water. That is the chief objection to it, but the calcareous matter which gives hardness to the water becomes soft by boiling, and is deposited. Almost all the crust which is deposited in a boiler from London water is a carbonate of lime crust; it is not adherent to any great extent, and is very easily removed from the boiler. It differs very considerably in its texture and firmness from the crust formed from sulphate of lime or salinitic water. In the year 1851 there were certain chemical commissioners appointed—Dr. Hofmann, Dr. Miller, and Professor Graham. They reported that water containing 92 grains of carbonate of lime, and from 30° to 90° of hardness, might be taken without any injury to health; that represents the same proportion of carbonate of lime or its equivalent; it may be sulphate in the water. This is the opinion of English chemists—all men of first-rate celebrity. The French commissioners also reported that a hard water seemed to be more salubrious than a soft water, but I do not go altogether so far as they do in the matter. They came to the conclusion that hard waters were really beneficial—that fewer conscripts were rejected coming from a hard water district than from a soft water district, and they thought that the calcareous matter was probably food, and was necessary for the development of the tissues; that was a consideration which weighed very much with them in the selection of hard water for the supply of Paris. [Witness handed in a table showing the composition of the waters of the pumps and surface wells of the City of London.] There was a process patented by Dr. Clark, of Aberdeen, in 1841, for removing carbonate of lime from water. That has not proved successful when used upon a large scale, but, as far as I know, it has never been used on a larger scale than it was used at Plumstead, and there they softened not much more than 600,000 gallons a day. The difficulties in the way of its application on a large scale are very great. I have made a great many calculations with regard to the use of animal charcoal.

Mr. Cripps said he did not propose to ask the witness a single question upon that point. He did not see how it bore upon the Act of 1852.

By Mr. Clerk: In the course of my experiments I had to examine the state of the sand after the filtering process had gone on by the different companies. At the time of our visit to the companies works we made a very careful examination of the manner in which the water was filtered. We found that filtration was effected, generally speaking, through three feet of fine sand, and then through coarser sand, and I was curious to know not only from an analysis before filtration and after filtration what was taken out of the water, but also by an analysis of the sand to ascertain whether it was practically an efficient agent for the purification of water, and I had samples of the sand taken from the filter-beds and the sand when washed and ready to be put back again, and the analysis of the sand and the experiment show that a very considerable portion of organic matter is taken from the water by the filtration of the water through the sand. They have always reserve filter-beds, and as soon as a filter-bed gets what may be termed foul, and ceases, perhaps, to pass water as freely as it should, that bed is thrown out of use, and the foulness is found upon the immediate surface of the sand; that is taken off, going down to such a depth as the colour would indicate the presence of impurity, and that is then well washed, and is in a condition to go again into the filter and to carry on the operation a second time. After a time the sand breaks up, and it is an item of some importance in the expense of the water companies, the renewing of this sand. There is a particular weed, which we call silt-weed, which grows very rapidly upon the filter-beds in the summer time, causing a difficulty in the filtration of the water, and necessitating the cleansing of the beds more frequently than at other times; indeed, if it were not that the matter were stopped at the very surface of the sand, the filtration of 100 million gallons of water taken in the metropolis would be almost impracticable; but the organic matters in suspension being stopped by the finer sand, when that is taken off and washed, the sand is restored to the state it was in, or very nearly, when it was originally put down, excepting that it contains a little more carbonate of lime. Last year I was directed to make a report with respect to certain matters connected with the supply of water to the City, and my attention was then drawn to the system of constant supply, in consequence of a circular which came from the Metropolitan Board of Works asking for information upon certain points. As medical officer of the City, my attention has long been turned to the question of supply of water to the poorer inhabitants. I am not an advocate for water within the houses of the poorer classes, but there can be no doubt that a constant supply of water, easily accessible to the poor, would be a matter of very great importance. [Witness handed in the report.] I have also a list of places where a number of pumps have been got rid of, and a vast number of stand-pipes put up in their places. [Table handed in.] In my experience as medical officer of the City of London I have found great difficulty in getting the owners of property to comply with the requirements of the Act of 1852, in putting their houses into such a condition in the east of London, I know of no house, even in the City, where there is as to receive a constant supply; indeed, with the exception of a few houses a constant supply. The houses are not in such a condition as will admit of it. Without some arrangement being made, the constant supply would be really injurious to a great deal of this property, by making houses damp and having them flooded. Property of that description is so little respected that although I may to-day order a landlord to put the fittings in the proper condition, and have a ball-tap to the cistern to prevent the waste of water and leakage, immediately it is done it is stolen; and the practical difficulties in the way of meeting that case in the houses of the poor are such that I really do not know how to deal with it. I have examined the Kent water regularly since the year 1863, and have made some careful analyses of it. It is so free from organic matter that when it is looked at in a very long glass tube it is nearly blue. It is like distilled water in that respect; nevertheless it gives off a great deal by incineration occasionally, but it is no indication of organic matter. When examined by permanganate of potass, which always detects the presence of organic matter, it shows very little of an oxidizable character. In 1867 I made out a table showing the composition of the Kent water. The average amount of organic matter is about two-tenths of a grain. The water supplied by this company is particularly wholesome; it is rather hard, having a good deal of carbonate of lime in it, which is reduced by boiling to about 5½° or from that to 6°. The quantity of carbonate of lime in the Kent water averaged 13 or 14 grains per gallon, and there are between 5 and 6 grains of sulphate of lime in addition.

Mr. Kekewich: I dare say you are aware that the water which flows out of limestone or gravel has very fertilizing qualities, but that the water which comes out of clay has not—I mean for purposes of irrigation. Is it more or less wholesome in a sanitary point of view?

Witness: I should think the water coming from a chalk and a limestone district are more wholesome than waters coming from the clay; the waters coming from the clay are insipid, and may really be expressed by the word cold waters—unpleasant water. They have not always fertilizing properties, their fertilizing qualities they owe to the presence of nitrates; and with regard to some of the lower green sand waters, which contain nitrates, confervæ grow in these waters almost immediately after issuing from the spring, and these are matters we find very great difficulty in dealing with.

Cross-examined by Mr. Cripps: I think that if the constant supply could be regulated in such a manner as that all the contrivances and appliances were kept in proper order, it would be a boon to the inhabitants, but I do not think the constant supply, without the presence of cisterns, would be an advantage. In my report I express my opinion that nothing could be easier than to obtain a constant supply, if it were really wished for, under the specified legal process. The first thing that would have to be done is for four-fifths of the inhabitants of the district receiving the supply from the main to sign a paper to the effect that they wish for it. Then there comes the question whether the fittings are in proper order; the next is, that if one-fifth object, and their fittings are not in condition, the water company need not supply. There would be a difficulty no doubt in getting four-fifths to agree, but the difficulty only indicates that the public do not seem to care about a constant supply. If the constant supply were a crying necessity, I think you would find four-fifths of the people asking for it. There would not have been originally so much difficulty, but at the present time the difficulty is very great; you have to overturn the old system, and bring about a new condition of things.

Re-examined by Mr. Clerk: In the City of London the local authorities do not take up this question very much of the supply of houses with the constant service, but even if they were to do so the landlords would object to lay out the money necessary for the constant supply. I should not consider that the water companies are the persons who are to be at the expense of adopting it as a sanitary improvement. I should have thought, with regard to that matter, that either the local authorities or the public should bear the expense, to a large extent at any rate. In the east of London there are two water companies that are quite ready, whenever circumstances will admit of it, to give the constant supply. When we wished during the time of the cholera to abolish the City pumps, we found it necessary to supply water to the whole of those districts, and we applied to the New River Company and the East London Company to supply them with a constant supply in those districts, and they did so with the provision that there should be some instrument to prevent waste. The East London Company have got over the difficulties about requiring the whole of the parishes on a main to have their fittings in a proper condition to receive the constant supply, by giving a limited supply by means of diminishing the aperture through a ferrule, and that I am told is done to 25 per cent. on the whole district In 1852 some inquiries were made in the City of London very carefully by Mr. Haywood and my predecessor, Mr. Simon, for the purpose of ascertaining what quantity of water should be supplied per room of a house in the poorer districts, for those houses which come under the denomination of the common lodging-houses of the City, differing from the common lodging-houses outside the City. The investigations led to this, that the first-class houses, with from 12 to 20 rooms, and with very good cisternage, and water-closets, and baths, consume 12·87 gallons per head; the second-class houses, with good cisternage, consumed 7·41 gallons per head; the third-class houses of the poor, with bad receptacles, consumed 3·65 gallons per head; our model lodging-houses consumed 6·5 gallons per head; in the courts and alleys, where there were stand-pipes, and no other water supplied to the houses, the quantity consumed was 5·1 gallons per head. Then taking the workhouses, were there was probably much care used to prevent waste, we found that in St. Martin's Workhouse the quantity of water consumed per head was 3·68 gallons per day, in Clerkenwell Workhouse the quantity of water consumed was 3·1 gallons per head per day, and in the Holborn Union Workhouse 5 gallons per head per day. We therefore concluded that 6 gallons was a good amount per head, and as the average of the City showed in those houses four people in a room, we laid down the rule that 2·4 gallons of water per room should be delivered in the four districts. How much of the consumption is due actually to food, and how much for other purposes, is a very difficult thing to arrive at. If we take the first-class houses, we find in round numbers 13 gallons per head used, and in the poorer houses 5 gallons per head used; the difference of 8 gallons must be due to the use of it in water-closets and for baths, and probably for greater cleanliness and so on than is followed in poorer houses. The amount of the consumption for food is very difficult to arrive at. The quantity of water that is passed away from an individual per day amounts pretty nearly to a pint and a half, or from that to a quart, and perhaps we might say that no more than that at any rate is drunk. The quantity used for cooking and washing, again, is very difficult to arrive at. I am certain that not any of the mineral matters in the water are in any way injurious to health. We do not know what the organic is. If it were ordinary vegetable matter, it could not be injurious to health in that proportion. Supposing it were peaty matter, it would give the water a dark colour—in fact, one-tenth of a grain of peat matter in water would give that water almost the tint of ale, but as far as I know it is not injurious to health; but if it was animal organic matter in a state of putrescence, there is every probability, or certainly it is possible, that it would be injurious to health. The peaty water would not be injurious to health if it did not go to more than two-tenths or four-tenths of a grain per gallon. If more than that, it would have the effect on some people of producing diarrhœa and dysentery. There may be other matters in water which are not appreciated in any chemical analysis, and those may be injurious to health. We know nothing of what the cholera germ is, or any other germ. The germ of that class of diseases may be in water without our being able to recognize it. We cannot by chemical analysis detect the presence of those things which we can see by a microscope in small quantities of that kind. But if living organic matter were there in any large quantity it would be discoverable by chemical means; but the proportion which would stand at the bottom of a gallon of water, and which would be discovered by a microscope, could not be discovered by chemical means. That which is present in the water, and which is discoverable by the microscope after filtration, has in all probability come into the water since the filtration has been effected—probably animaculæ and confervoeal matters which have grown in the water. If the water has been well filtered you need not fear the presence of those creatures in such quantities as to be discoverable by the microscope. It is going a little too far to assume that those animaculæ which you see in water are injurious to health. We have no evidence that they are injurious to health.

Mr. Clerk: Some of them may be the bearers of cholera, or other specific diseases?

Witness: That is an assumption that we know nothing about at the present moment.

Mr. CLERK: Is it not an assumption of the faculty at the present moment that a great many diseases are transmitted by animals of some kind orother?

Witness: Yes; that is so. It has been thought that flies carried the rinderpest.

Mr. CLERK: Therefore, all those animals which may be seen through a microscope may be present without your detecting them by chemical analysis?

Witness: I can agree to that; but I cannot agree that those animals are the carriers of the cholera germ.

Mr. CLERK: You do not agree with the theory that specific diseases are transmitted by a specific kind of infusoria?

Witness: Not infusoria. Specific diseases are transmitted by specific agencies, but whether those specific agencies are living germs or matters in a state of decomposition we cannot say, and still less can we say that they are conveyed by infusorial animals.

Mr. CLERK: Assuming that the matter, at all events, is animal or vegetable matter, it would then be represented by this grain, or whatever it is, of organic matter, the characteristic of which we know nothing.

Witness: It would; but we are very far off from arriving at a conclusion. We have not at the present time any absolute test for discovering organic matters in water, and much less the nature of those organic matters.

Mr. CLERK: Are there not chemical substances of which half a grain or a quarter of a grain taken every day would produce a serious effect upon health?

Witness: Yes; there is an acid called picric acid, which may exist in water in a very small proportion indeed, and may not even tint the water; nevertheless, it shall give to it a very distinct bitter taste, and it shall affect the nerves of sensation in that way, and there may be other things in an equally small proportion which may affect the system and produce disease; but I cannot answer the question as to what is the smallest quantity of any particular matter that would be capable of producing any injurious effect. Strichnia may be put into water, provided it is not converted into a salt; but, in its free condition, strichnia will give to water a bitter taste when there is a very minute quantity indeed in the water. The sixteenth part of a grain can be detected by chemical analysis. We can detect ammonia in water when the quantity does not amount to anything like that. One part of ammonia in 70 million parts of water is very easily discoverable; but I do not think that ammonia by any physiological test may be discoverable. Then you may go the other way, and say that there are probably forms of matter which are not discoverable by chemical means, but nevertheless they would be physiologically or pathologically active We cannot distinguish absolutely vegetable from animal substances in water, unless they are in so large a quantity as to show us their marked properties, when they can be tested. There is no doubt that the present system of discharging the sewage of towns into rivers is a very improper system, although the water has a very wonderful power of self-purification, when it is exposed freely to the atmosphere over a run of 7 or 8 miles. Take, for instance, common sewage going into 20 times its bulk of good river water; in the course of a run of 7 or 8 miles it becomes so purified that nothing of sewage can be discovered in it by chemical means, and such water may be used under ordinary circumstances for domestic supply for years and years without any injurious effect being perceived.

By the CHAIRMAN: I have made inquiries into the condition of water after it has been in the cistern for some time, as compared with the water as it is supplied from the mains. Very frequently the water is much contaminated by matters which have either fallen into the cistern or have entered the service-pipe. Ten days ago, some water was put into my hands for examination, received from a cistern in one of the houses in the City, and I found it largely charged with drainage impurity; and, upon inquiry, I found that one of the service-pipes which carried the water from the main to the cistern passed through a dung-heap; a little hole had been made in the pipe by oxidation, and the drainings of the stable manure had entered that pipe, and every time that this water was delivered to the cistern that which had oozed into the pipe was delivered into the cistern. I have found dead animals frequently in the cisterns of the poor, and the water often charged with decomposing organic matters. The bottoms of the cisterns of all poor houses, unless they are cleansed about every month or six weeks, have a deposit of filthy matter; generally speaking, the cisterns are uncovered, and they are placed in situations admitting of the access of filth of all descriptions. If they were covered, they would take the covers away immediately, and chop them up for firewood; we do not know how to deal with those cases. The matters falling from the atmosphere in London into a cistern do not do much injury. I have examined the rain falling in London, and also snow, and I find there is a good deal of carbonic matter in it, but that would not pollute the water to any great extent; that which goes into the cistern is generally grosser matter than that. The blacks and dust of London constantly falling into a cistern, over a long period of time, would form an accumulation at the bottom of the cistern, but not in the course of a month or six weeks. There is a great indisposition on the part of people to keep their cisterns clear, and in good order. I should like to see the cisterns in the whole of those houses done away with altogether, except those supplying closets; and I would have stand-pipes placed in a court or alley, and have some contrivances by which the waste might be prevented. I know several places in the East London district, outside the City, where waste water preventers exist.

By Lord EDWARD CAVENDISH: I have known the water in a cistern become impure from too close contact with a water-closet. The gases which are evolved from the closet are absorbed by the water in the butt, which is, generally speaking, in the poorer class of houses placed close to the closet; and this has been such a constant source of pollution in the City of London, that I have for some years done away with the supply of water to closets because the pipe that delivers water from the butt to the closet is the means whereby the foul gases are carried from the closet to the butt. By putting a pail of water down the closet three or four times a day we can keep it cleansed.

William Odling, Esq., M.D., examined by Mr. DENISON.

I am a lecturer on chemistry to St. Bartholomew's Hospital, and have had a good deal of experience in examining water for the supply of towns I was for two years officer of health for Lambeth, and assisted Dr. Letheby and Mr. Abel in analyzing the various samples of water in December last, and in January and February of this year. They consisted of water from the West Middlesex, the Grand Junction, the Southwark and Vauxhall, the Lambeth, the Chelsea, the New River, and the East London Water-Works. The tables which Dr. Letheby has put in were the result of our joint labour. I was present whilst Dr. Letheby was being examined.

Mr. DENISON: As I observe my learned friends on the other side do not raise any chemical questions, I do not think I ought to do more than ask you whether you agree with Dr. Letheby.

Witness: Substantially I do. There are one or two small points of difference of opinion, but nothing that I think necessary to mention to the committee.

Frederick Augustus Abel, Esq., examined by Mr. DENISON.

I belong to the Royal Naval Arsenal, at Woolwich. I am Vice-President of the Chemical Society, and I direct the chemical establishment of the War Department. I took part in these analyses. I agree with Dr. Letheby's evidence.

TENTH DAY—TUESDAY, JUNE 4.

Mr. CRIPPS addressed the committee. He said the present inquiry was very different from a case where there was a definite bill brought before a select committee of the House of Commons. This inquiry was general, and the remarks or suggestions that he might make would, in the same spirit, be general also. He apprehended that this part of the case mainly turned upon the inquiry as to what had been the operation of the Act of 1852—whether it had fulfilled the object of its authors, or whether what was done at the time was done to some extent unadvisedly, and whether the Act consequently remained inoperative for the purposes for which it was intended to provide. It was rather remarkable that, although it was an Act comprising nearly 30 clauses, after section 4 there was nothing at all material which had ever been called into action in any way. In one of the subsequent sections there was the ordinary clause that the water-works companies were to consume their own smoke, and also a clause directing them to keep their accounts in a particular way, both of which no doubt had been done. The clauses following clause 4 related to the supposition that some new sources of supply should be found out, an anticipation which had not taken place. Then came provisions respecting complaints to the Board of Trade, to which he should have occasion to allude presently as being inoperative, and then, after some other clauses, came the 15th, which he thought was the most important clause in the bill. Prior to, and leading up to this Act of Parliament, a committee sat in two sessions, taking the greatest possible pains with the subject. He believed that that committee sat eight weeks upon that question—a greater number of days than any committee which had been appointed upon a question of that kind; and as Mr. Muir stated in evidence, a considerable part of that time was taken up with the inquiry into the relative value of the intermittent and the constant supply. But the result of that inquiry was the passing of the 15th clause, which was in these words:—"After the expiration of five years from the passing of this Act, every company shall, subject to the provisions of the special Act relating to such company, provide and keep in the district mains already laid down, or hereafter to be laid by them, a constant supply of pure and wholesome water, sufficient for the domestic use of the inhabitants of all houses supplied by such company, at such pressure as will make the water reach the top storey of the highest of such houses, but not exceeding the level prescribed by the special Act of such company." He took it that it was quite indisputable that the committee intended that after giving a reasonable time, which they thought would be five years, to the companies to make alterations agreeable to the new system which was to be adopted, there should be a new system adopted in London, and that that system should be the constant supply; and had they stopped at that part of the section, no doubt long since London would have been so supplied. But the companies were represented there; and no doubt that committee, with probably a just view of effecting a compromise between the interests of the public and the private interests of the water companies, attached a proviso to that clause, the result of which had been that the clause had had no operation. Now, it was quite impossible that that could ever have been the intention of the parties. The proviso was—"That no such company shall be bound to provide a constant supply of water to any district main until four-fifths of the owners or occupiers of the houses on such main shall, by writing under their hands, have required such company to provide such supply; nor even upon such requisition in case it can be shown by any company objecting to the same that more than one-fifth of the houses on such main are not supplied with pipes, cocks, cisterns, machinery, and arrangements of all kinds for the reception and distribution of water, constructed according to the regulations prescribed by the special Act, or by this Act, or which any company, with approval of the Board of Trade, may from time to time make in that behalf." And then followed other provisions, to which he did not think it necessary particularly to call attention, because that first provision of itself was sufficient to do that which it had done in the result; it had entirely prevented any action being taken upon the enactment of the clause itself. Dr. Letheby—who came as a witness for the other side, and who had had a good deal of experience in matters of this kind—admitted at once that, even in the wealthier districts of London, and where persons were more intelligent, there had always been the greatest difficulty in getting four-fifths of the inhabitants in any district to assent to any particular change which might occasion them the most casual temporary inconvenience or the slightest additional expense. But among the higher classes in London probably the evil was not a crying evil. The question really affected, in a tenfold degree, the poorer classes. But, when some clauses of that kind came to be passed, and when it was considered who the parties were among whom it was desirable that this Act should be set in operation—the poor in the east of London, or the poor of our courts and alleys of the lower parts of the metropolis—was it not perfectly idle to think of four-fifths of the occupiers of those places, by writing under their hands, agreeing to a matter of this kind? And, if that clause remained as it did at present, as a condition precedent upon the granting of the constant supply to London, had the committee any hope whatever that there would be any difference in the next 15 years from what had been in the last? That, he apprehended, was the main point to consider. It might have been said on the other side that the Act itself was improvident, and that the proviso was better than the enactment, and it was advisable that that enactment should have been overruled, and it was not advisable that the enactment should be operative under the altered state of circumstances or with greater experience. And that was the only sort of answer that he could conceive could be given to any defence whatever of the Act of 1852. He could conceive the parties saying—although he thought the argument would be a very bad one—that five years was given as a sort of time of trial, during which other circumstances might possibly arise to prevent the constant system being adopted; and, under the circumstances, it was not desirable to adopt the constant system. That, however, was not the argument which the companies had adopted here, nor did he think it was the kind of argument which would be very likely to prevail. In those 15 years a great addition had been made to their experience; those 15 years had been most productive of all kinds of improvement in sanitary matters, and they had been productive of an immensely increased experience with regard to the advantages to be derived from the constant supply

system. He did not think that one of the engineers of the water companies, biassed as they were in favour of their existing system, had had the boldness positively to say that he thought *per se* the intermittent system a better system than the constant system of supply. All the evidence had rather been to the exaggeration of the possible difficulties that might arise from the change. Mr. Simpson, in his cross-examination, gave a list of a great number of towns and places which had been supplied on the constant system, and others in which the constant system had been adopted as a supercession of the intermittent system that they had had before, and he was about to add most important evidence upon that matter. He was about to call Mr. Bateman, than whom no engineer in matters of this kind had had greater, he might almost say as great experience, who would state the advantages which he conceived to be resulting from that constant supply. Mr. Bateman, in a paper which he read before the Social Science Congress, had expressed his opinion upon the subject of the constant system in these terms:—"The question of constant supply is one which most materially affects the comfort and convenience of the poorer classes, and the inhabitants of smaller houses. In larger houses ample cistern space is generally provided to secure the equivalent of a constant supply; but where water is constantly laid on from the street mains there is scarcely any occasion for house cisterns, except for the supply of water-closets. By proper arrangements little or no inconvenience is experienced from the occasional shutting off of water for the changing or attaching of house services. The first cost of introducing the water to the houses is reduced to the lowest possible point, and the pollution which more or less commonly attends the stowage of water in house cisterns is entirely prevented; the water is delivered in the purest, freshest, and coolest condition; and very much of the annoyance and inconvenience arising from frozen cisterns and burst pipes, which are the common attendants of the winter season, is avoided. There is no occasion for exposed pipes in out of the way places, for cisterns in roofs or the tops of the houses, to be filled with soot and dust in summer, and to be frozen in winter; and a man may live in tolerable comfort, without the dread of the water bursting above his head and deluging the apartments in which he resides. But the advantage of constant supply to the consumer has been so often and so clearly demonstrated that it is useless to dwell further on this branch of the subject." The committee were aware of the report of the River Lea Commissioners, who had incidentally come to a conclusion upon the question of water supply. They stated that "Over the greater portion of the district, in dwellings above the class of court houses, the inhabitants have tanks, or tubs, which are filled each day. The supply becomes in part constant in all cases where the companies can treat with landlords willing to make proper stowage arrangements in tanks and cisterns, which may be filled each day. The supply of water to house property of an inferior class is for the most part intermittent, and only on six days in the week, Sunday not being a day of supply. The water is turned on for about half an hour each day; in many of the courts the apparatus is an open wrought-iron stand-pipe, of about 1 inch in diameter, having no valve upon it, so that the water flows to waste under whatever local pressure there may be when not actually being caught by some one or other of the inhabitants. This defective and unsatisfactory mode of supply leads to great waste of water, even during the short period of half an hour. Also the receptacles, where they exist, are often unfit to store the water. Some tanks are placed over the water-closet and dust-bin, and the open tubs stand in small crowded yards, exposed to any dirt, dust, or atmospheric contamination there may be." In point of fact, it was so obvious that if the water necessary to be stored was to be stored in appliances of that kind, all the care taken for pure delivery in the first instance was nullified. That applied, more or less, in all cases of storeage, and with all cisterns, to some extent, in houses of the wealthier classes, where care was taken that the cisterns were properly cleaned out from time to time; but to the poorer classes, for whose sake alone he apprehended the committee were dealing with this question, the storeage of water of that kind was in itself the greatest possible evil. Dr. Letheby gave some instances which came under his observation of the abominations which get into their tubs and storeage places, which could not be prevented so long as the system allowed them to be practicable. The River Lea Commissioners in their report came to a decisive conclusion upon this subject, and the last recommendation that they gave was, "That legislative measures be passed to render it compulsory upon each company to supply water upon the constant system throughout its district, and upon owners of houses to furnish their houses with proper arrangements to receive such supply." There was nothing in this report which would show how the commissioners intended this to bear upon the Act of 1852, nor did he imagine that that was a thing which they would have thought would come within their province. Nor could he conceive why it was that in this inquiry the companies showed so much pugnacity about matters of this kind; they seemed to assume that he was here on behalf of the Board of Trade in some hostility to them, which was not the case, or to assume that they must, under all circumstances, maintain the existing system, and that they were so bound up with it that it would be dangerous for them to attempt to go out of it in any way.

The CHAIRMAN: They have no *locus standi* to object to the constant supply, provided it is under the Act, and the whole contention is, whether this Act is laid for the purpose of obtaining a constant supply of water, and whether section 22 is the proper mode of getting it.

Mr. DENISON: You talk of our pugnacity, and then the chairman says that we have no *locus standi* to object to the constant supply. Let me say that we do not want to object to the constant supply.

The CHAIRMAN: Do not let us get into a controversy which really has no existence, because the water companies are, under this Act, peremptorily required—and they have not come here, as far as I can understand, to shrink from the requisition of the Act—that in five years they shall be prepared to give a constant supply upon certain conditions. The whole contention is, whether the conditions imposed by this Act are the proper conditions, so far as we have a knowledge of the subject, to enable them to fulfil the objects of the Act, and if not, what are the conditions. There is no contention upon the question of constant supply. The question is, whether the constant supply is to be in the manner directed by this Act, which is exemplified in section 22, and if not, then in what other manner it can be done, and what is right and proper for the public and the companies. We could not hear the companies to repeal the Act that has been made, nor have they asked to repeal the Act. They have not asked to be relieved from the 22nd clause, therefore that is absolute.

Mr. CRIPPS said a considerable portion of the evidence given by the companies would rather be to show that the intermittent supply was perfectly satisfactory, and that there was no occasion for alteration. They had not said positively that the constant supply was not the best, but they had given a good deal of evidence which would lead the committee to believe that the policy of the Act was not good, and that the necessity for a constant supply did not exist, and that it would not be expedient to adopt it in the metropolis. If that was the view of the committee, he need scarcely take up their time by referring to a number of reports, all of which assumed that the constant supply was a right and proper thing to be adopted for London. [The learned counsel, having quoted at some length and commented upon the reports of Captain Tyler and Captain Shaw, proceeded.] He might, perhaps, refer to Dr. Letheby's evidence, and to his report, which was as strong as any other evidence of the advantages of a constant supply by itself. Indeed, he was reminded that Dr. Farr's report was to the same effect, and he would refer them to a passage in his report:—"Whoever will take the trouble to go among the people now suffering in crowded dwellings will see the danger of the water-butt; poor women are washing the dirty linen of patients with water drawn from those vessels, which are often found close to the water-closets. It would be a source of additional safety to London if the tanks and butts were all abolished, and the pipes were filled on the system of constant supply. The time has come for this reform;" but, in fact, if it were necessary, he might multiply reports and evidence indefinitely. The time had come for reform. It was full late for it. London was behind-hand, and more enterprising towns than London in some of the provinces had adopted the system long ago. How long London desired to hang behind the rest of the towns he did not know, but the time had come for a change, and what was the answer which the water companies made? He came now to what he thought arose more immediately upon the question before the committee. In a single word, it seemed to be entirely a question of expense, and an increased expense, not only to themselves, but to the consumers of water in the metropolis, which, they said, those consumers were not willing to incur. They added to that that a considerable amount of supervision would be necessary, which they assumed that parties would be very unwilling to have exercised; and then they said that there would be a considerable waste under such a system, so that, in point of fact, London would not be able to be supplied on such a wasteful plan. He thought that, in a general way, those were about the arguments, put in somewhat different ways, which were used by the engineers of the water companies. In point of fact, they were afraid to move; they desired to keep things as they were. He believed that all this was an immense exaggeration. First of all, it was all speculative, because they had not tried it. Mr. Bateman, in his report, said: "The question of its adoption does not entirely rest with the consumers, but with those who have to provide the water. It is believed by many that the consumption under the constant supply system is so great that no company or water-works can meet the demand; it would be ruin to them if they attempted it. I cannot but think that all this is a delusion; it is not that more water is actually consumed for the use of the individual under the one system than under the other, but that the amount of waste which results from bad pipes and bad fittings constantly supplied with water is so great as to occasion serious loss and inconvenience to a water company, and perhaps, in some cases, to exhaust their supply. The experience of those towns where the supply has always been on the constant system, and where every precaution has been taken for the purpose of securing good workmanship, the best and strongest materials, and the most improved apparatus, the consumption of water per head is certainly not more—probably less—than it is in towns similarly circumstanced in all other respects, but supplied with water on the intermittent system. This is abundantly proved by the statistics of water supply in such places. For instance, the average consumption of water in the manufacturing towns of Lancashire and Yorkshire is from 16 to 20 or 21 gallons per head per day for all purposes, including trade, and, of course, all the waste which may be taking place. In Manchester the quantity consumed by about 600,000 persons, and by the trades demanding water within the district supplied, varies from 12 to 13 million gallons per day. Of this quantity it is estimated that one-third is supplied to manufacturers, leaving the net quantity consumed for domestic purposes, including waste, 14 gallons per head per day." And then Mr. Bateman proceeded to mention a number of other instances proving the same thing, with which he (Mr. Cripps) would not trouble the committee, as he was about to call Mr. Bateman, and it would be more satisfactory to hear it from himself; only he used it for the purpose of showing that it was the opinion of a practical man who had tried the change, and as against those persons who were merely speaking speculatively. His idea was that the whole of that was a delusion—that, in point of fact, it was a bugbear, and that it was an immense exaggeration; and if the system were adopted the difficulties would disappear to a great extent. That seemed to run through the whole of the evidence which had been given in this case with reference to the expense which would be entailed. In the first place they spoke of the increased cost which the change of system would require. That was to be balanced to a great extent by the fact that the new houses would require a much less expensive system of cisternage and so on than the old intermittent system. But, after all, would the cost be in any case a considerable one, even taking it as they themselves stated? He admitted that when the immense population of London was considered, and the aggregate total, the total expense sounded very large; but it would be distributed over every house, probably in proportion to the value of the house itself in which it would be required, and in that case the expense per house would really be very small; according to their own estimate it would not amount to more than about half the water-rate a year.

The CHAIRMAN: Do you mean the aggregate water-rate, or the water-rate of each house?

Mr. CRIPPS: The water-rate of each house for a year. Probably about one-half the water-rate of any one year would cover the expense.

The CHAIRMAN: The water-rate for a £20 house would be 20s., and the evidence is that the new pipe would be £5, £10, and £12.

Mr. CRIPPS said he knew that was the evidence, but he was going to alter that evidence considerably he hoped by what he was about to add to it. They had put it in some cases as high as £8 per house. The witnesses varied very considerably in what they thought would be the expense; in fact, it was merely speculative. Probably the expense might be large, just in proportion as the present fittings were defective; but if there were a perfectly good pipe, or a new pipe, good for the present system, the alteration would be very small. If there were a defective pipe put down some time ago, and just about to burst now, of course that very likely would burst, even with the intermittent system, in a short time; and if something perfectly good and effective had to be supplied for that it was not correct to apply the whole of that expense to the alteration to the constant system. A great deal was due to the defective arrangements in the first instance, and to the renewal of the old thing, which, under any circumstances, would become necessary sooner or later; but it was a purely practical question, and he could not conceive that anything could be more conclusive upon that matter than the evidence which he could give by those who had had the alteration of those matters, who had done it, and who knew what the expense was in this or that particular case. But they went on to say that

the system of supervision would be intolerable. He thought that was an unwarrantable assumption. A great number of restrictions of that kind had been introduced lately into sanitary Acts, and it had not been found that the restrictions upon individuals prevented those sanitary measures being carried out. Everybody who lived in the midst of a large community must sacrifice a portion of his individual liberty for the benefit of the community at large. All this evidence of the additional supervision, if it were necessary to be introduced in order to give a more perfect water supply, was only part of that general principle. In fact, from Dr. Letheby's evidence, connected with the evidence taken by Captain Tyler before this inquiry, a system of supervision appeared to be, under any circumstances, essential in the case of a water supply. The probability was that, at the first change, there would be a necessity for a considerable amount of wholesome and proper supervision in the interests of the companies, as well as of the community generally; but after a time persons would get used to the new system, the necessities of constant supervision would decrease, and that state of things would be arrived at which existed in other towns where it had been adopted, and where, in the first instance, a good deal of supervision was found to be required, but where, from time to time, it had been rendered less necessary as parties became habituated to the new system. Neither was it correct to add that the supervision was an additional expense, or that it was an additional difficulty to the new mechanical appliances, because if new improved mechanical appliances were obtained the necessity for supervision was diminished. And if a system of constant supply were applied to London, and it were essential to have some apparatus which would prevent waste, inventive genius would not be very far behind in finding it out. Inventions could not be expected to come till the necessity for them arose. While the intermittent system existed there was no necessity for appliances of this kind, but once adopt the constant system, and for the first year scarcely a week would pass without some new contrivance being patented for the purpose of self-acting to prevent waste. In fact, all these difficulties appeared to him to be great exaggerations, and he could not conceive a stronger proof of exaggeration than when you had the engineers of the water companies coming before the committee and saying they had tried these experiments, and they put the result of these experiments before the committee to show how great the waste would be. Those experiments were made to support foregone conclusions in every case. They might be valuable enough in the way in which they were made to the companies who made them, but the companies desire was to prove the benefit of the intermittent system. But if they were attempted to be made with a view to be brought in evidence before the committee upon this matter, they were most contemptible. It was admitted that under the constant system there must be a careful supervision certainly in the first instance, and proper mechanical appliances. The constant supply was attempted in the experiments, not only without either of those conditions, but without giving notice to the parties in the case where they were applied that any change whatever was to be made; and one of their witnesses actually admitted, unless he greatly misunderstood him, that the two results that he gave were only two out of a number of experiments, but they were the two which made out his case, and which supported his view of the case as against the constant system.

The CHAIRMAN said they only proved exactly what they professed to prove—that if the thing was left just as it was, and the constant supply was introduced, that would be the result.

Mr. CRIPPS said they only proved what might happen in a state of things which nobody would regard as proper or probable to be adopted, and therefore he thought the experiments proved nothing more than the indisposition of the engineers who made them, or the companies who adopted them, to adopt, and really and fairly to try the constant system; because, if those engineers had chosen in all instances, he believed they had the means of giving the fairest possible test of what would be the result of a constant supply. They had used the words—"We wished to know the worst of it;" and therefore they made the experiments in that sense. But they had the means of giving other experiments, for Mr. Muir, and certainly Mr. Morris, and he thought Mr. Simpson too, had instances where they had supplied by meter, and, therefore, where they could tell at the end of a year, or of any given time, exactly what amount of water had been supplied, and, by giving the number of houses to which that water had been supplied, and an estimate of the number of inhabitants in each, they could have given a very true and satisfactory test of what the consumption of water was under the constant system, and what the price of the consumption. But they had not taken the trouble to inform the committee. He did recollect one passage in Mr. Simpson's evidence which was very important, as showing that he had adopted it in one instance.

The CHAIRMAN: That was the case which he gave of the fittings, all in order at the beginning of the supply, and at the end of a certain period they were all in disorder. That is the evidence that he gave.

Mr. JOHNSON: And the same with Mr. Morris, in one of his experiments.

Mr. CRIPPS: In Mr. Simpson's evidence he mentioned the model lodging-house of Miss Burdett Coutts, where, he said, "they have cisterns for each floor; they are supplied by meter, and the water is constantly on; but our observation leads to this: that since the house has been rather more fully occupied than it was at first, they use nearly 7¾ gallons per head per diem." That was a very small allowance as compared with the general consumption of London, which he thought was about 32 gallons per head per diem, or something of that kind. That, so far as it went, was a test. Several of the water companies engineers had said that, even if there was a constant supply, there should be a cistern of some kind; and that appeared to have been contemplated in the Act of 1852. Now that being so, he could not but think that the whole of this was a needless case of alarm, and it appeared to him to be merely a question of time when London was to be furnished with a constant supply. That it would be a great blessing to the poor was admitted; that it was intended as long ago as 15 years back was admitted—therefore it was not new; and, come when it might, did anybody doubt but that the system of intermittent supply in London was doomed sooner or later? It was not possible to suppose that London would go on being behindhand in a matter of this kind. There was no reason why it should; and, in whatever shape the change might come—whatever details might be essential for the purpose of carrying it out, those details ought to be devised, and the obligation ought to be upon the companies. If he were there with a bill, of course he could go further, and say that he thought in this or that particular way, or by this or that particular clause, the matter might be obviated; but he could only now speak generally.

The CHAIRMAN: If you are here to amend a bill, one would suppose that it is necessary for the amendment to be, at all events, as precise as that which you propose to amend.

Mr. CRIPPS said he thought not. He did not know that the obligation of framing a clause was at all essential, when no bill was before the committee, under any circumstances.

The CHAIRMAN: I do not mean in language, but I mean in substance.

Mr. CRIPPS said his answer to that was this—and it would be comprised in his objections to the 23rd section of the Act of Parliament, as well as to the other sections—that it should be compulsory upon landlords to fit houses of the description which were now being specially considered, in such a way as should enable the companies to supply that which they should be compelled to supply—namely, the constant system; that the evil was so great to persons of that kind that a way must be seen through it in some way or other, and it would be apparently but fair to put upon the companies the entire expense of a matter of that kind.

The CHAIRMAN: You see section 22, assuming that the companies at the end of five years may, whenever required, be ordered to give a constant supply, declares that it shall be by means of a cistern; and, without going into the language and amending it, do you submit to the committee any definite plan by which a constant supply is to be given, different from that provided in section 22?

Mr. CRIPPS said if the committee reviewed the evidence already given, in connexion with the evidence which he should have the honour to lay before them, they would probably find that there were differences of opinion about the necessity or propriety of intermediate cisterns, but a constant supply could be given either with or without an intermediate cistern; in the one case the water would be drawn direct from the communication-pipe, and in the other the communication-pipe would supply the cistern, and the water would be drawn off from the cistern. Probably, if that was the plan, the cistern would be very small—it would be only, he supposed, a kind of waste preventer; and if the cistern would not be there, if superior appliances were found, the waste preventer could be adopted in some other manner. Then an intermediate cistern probably would be unnecessary, or another plan might be adopted. There might be a cistern, as it existed now, for the purpose of the water-closet supply and matters of that kind, and there might be a separate pipe upon the main from which the supply of water for drinking might be drawn, and which would not have to pass through the cistern. Those were details which required very full consideration, upon which he could only give the evidence of parties who were qualified to speak upon such a subject, and he believed that Mr. Bateman did not consider that cisterns were necessary at all. Then he was met by this section which said that the supply contemplated to be given in 1852 by that committee, contemplated cisterns intermediately; but he could not tell whether that was because they thought the intermediate cistern was, *per se*, a good thing, or whether it was only one of the means suggested by the water companies as a better means of preventing waste; it might have either. That would turn very much upon what the other means of preventing waste were. It was quite clear that, taken by itself, it was an entire prevention of waste as far that went—at least, to a great extent it was; so if the cistern had to be found, and when that cistern was full the cock was up, and though there was a constant pressure upon the water before it was coming in, the check was applied to it, and was not wanted to be applied afterwards, because it was there; but whether that was the best system to adopt was too much a matter of detail at the present moment to be entered into. He had no doubt his learned friends would very much like to pin him to some particular plan which they might be able to attack.

The CHAIRMAN: I merely ask you whether you yourself are going to set up a definite plan, or are only intending to lay evidence before the committee, and leave them to find a plan out of it if they can?

Mr. CRIPPS said, as far as the committee were concerned, that he thought was really all that he should be entitled to do, and that was what he desired to do. He could not go further than this in a general inquiry. He pointed out the defects under the existing plan, and he might probably, as far as he could by evidence, aid them in devising a remedy; but as far as being a party to coming there with a definite plan cut and dried, and perfect in all its points, to which hereafter one would desire to adhere, and to say he laid down such a plan, and which upon full consideration he thought in all its details was the best, he was not prepared to do that. He had dwelt entirely hitherto on the question of constant supply, but it was almost unavoidable that in doing so he had also stated all that appeared to him to be necessary to state with regard to section 27 of the Act of Parliament. Section 27 had been so far altered that the vestries were substituted for the churchwardens and overseers of the poor; but he thought, excepting in that respect, the spirit of that clause remained the same, and the spirit of that clause was this, that if it should appear to some particular authority—say the vestries, or any authority which might be substituted for them—that any house was without its proper supply of water, and also that it could be supplied at a rate not exceeding 3d. per week, according to the scale of prices, the churchwardens or overseers, with the consent of the vestry, might "give notice in writing to the owner or occupier of such house, requiring him within a time specified therein to obtain such supply, and to do all such works as may be necessary for that purpose." Practically, he expected, that did not work, and never would work. The vestries, not unnaturally, had a great indisposition to undertake for themselves work of that kind, and to become liable for it, and the result of that had been unquestionably that it had been a failure. He was not aware, when he asked the question of the different witnesses, which he did of each of the companies, how many applications had been made to them under that section, that that was one of the inquiries which the committee had specially directed attention to by the printed queries which they had sent out; but in all the answers to those queries the applications had been almost none. They had not been attended to, because the witness yesterday told them that at that end of London, where the applications might be expected to be most frequent, they had one application about seven or eight years ago. He treated an exceptional case of that kind as rather supporting the rule. The rule was undoubtedly that that section had been in operation. The section assumed, in the first instance, that there should be houses without a supply of water, and it enabled the vestries, when they found such houses existed, to call upon the companies to supply them with water.

The CHAIRMAN: Not without a supply, but not properly supplied.

Mr. CRIPPS said that there was another objection which had been raised by the companies which he thought had been very greatly, and almost improperly, exaggerated, which was as to the thieving propensities of the poor of London, who they said could not be trusted with any apparatus of this kind. He could not conceive that that could apply more to the constant supply than it did to the intermittent system. Under the intermittent system the cisterns must be larger than under the constant system, and those cisterns would be as tempting as any other part; and altogether, if you were furnishing a house for the first time, the constant system would be less expensive in its fittings than the intermittent. It was the change that the parties were afraid of. It had been suggested that a pipe under the constant system might stand out in a court, or somewhere where all persons might have access to it, and even Dr. Letheby, who seemed very much

impressed with the propensities of the poor in that respect, did not think there would be any danger of any stealing taking place; neither could he believe that the poor of London were so much worse than the poor of Manchester and other places where it had been tried, as to render that impossible of adoption here which had been adopted there. He believed it to be only one of those vague alarms which had frightened the engineers of the water companies, but which had no real existence when the matter was thoroughly inquired into. There was one other point to which he would direct the attention of the committee—viz., the inefficiency of the provisions of the Act of 1852 to satisfy the complaints of parties who thought they were aggrieved. Those provisions were unworkable; at every stage they introduced difficulties, and, in fact, had been as inoperative as any other part of the Act, and they had not been acted upon in any way whatever.

Mr. DENISON: You say they have not been acted upon. What has this thing come from?

The CHAIRMAN: There are two reports. This one arises under this Act of Parliament and the previous one also, and the report of further investigation by Captain Tyler, too.

Mr. DENISON: There is a monthly report upon the water to the Privy Council.

Mr. CRIPPS said he did not know that it had gone through all those forms; therefore he should qualify what he had said. He could conceive that in a time of very great emergency, like the cholera, there might be persons found who would take up the case for those people, and who would go through the inquiry directed by the Act at once, but it must be exceptional in its nature. He did not speak hastily to the water companies, but he thought that some proper authority should be appointed, to whom the matter could be readily and speedily referred, and by whom it could be decided. There was one other material suggestion which he thought it right to make, and that was with regard to the cost and the mode in which the new fittings should be put in, so as to be satisfactory to the company. It would not appear desirable to leave it entirely to the discretion of the company that they should be satisfied with the state of the fittings before they supplied the water upon the constant supply system. If it were left for them, according to the provisions of their special Act, and according to the regulations that they might make, with the concurrence of the Board of Trade, or a variety of matters of that kind, he thought that was going further than there was any occasion to do with justice. But there should be some third independent party—some party appointed as an authority, who should decide at once whether the fittings, if there was any controversy, were in such a state that the company ought to supply a constant service with fittings so constructed. If the companies were sincerely desirous of adopting the constant supply system, probably that provision might be enough; but he did not think it was desirable to leave the companies to make certain provisions to which they might possibly obtain the assent of the Board of Trade, because there might be nobody there to oppose them, and those provisions might be such as to offer very great and unnecessary difficulties in the way of compliance with them; but he thought it would be the better plan at once to appoint some proper officer by some competent authority who should have the power himself to say whether those fittings were right and proper or not. He did not desire any clause which should be unfair in any way towards the company; he desired one which should be fair as between the company and the owners, in favour of the company. The company was an organized body, and they acted with considerable interest in this matter, whereas the owners were a very separated body, and did not act in combination.

The CHAIRMAN: You propose that some local authorities should be heard before this rule is made.

Mr. CRIPPS said that would be one way of doing it, and, if the local authorities were on the alert, it would be very desirable; but he thought the better plan would be to appoint a proper officer to undertake the duty of superintending all matters of this kind.

The CHAIRMAN: That is what Capt. Tyler does for the Board of Trade. He is appointed by them, and, if any rules were sent to them, they would be submitted to Capt. Tyler, to ask him what he thought of them, and he would report upon them.

Mr. CRIPPS: That, no doubt, might be done under this clause.

The CHAIRMAN: It would be done.

Mr. CRIPPS said it had never operated, and therefore it could hardly be said how it would apply. He did not wish to ask anything which the committee thought was sufficiently provided by the Act, or which would be in any way onerous to the companies. He only wished to make those suggestions which the committee would bear in mind when they came to consider how the Act could be made operative. There were alterations which probably would be necessary in dealing with the matter by a new Act, commencing the matter entirely *de novo* with the present information.

The CHAIRMAN: You promised to tell us what suggestion you would make to set clause 15 on motion, in lieu of the four-fifths of the inhabitants endeavouring to find a district main, which they never would find as far as we can discover.

Mr. CRIPPS said that he pointed out that the clause as it stood had been inoperative, and he could only generally direct attention to the way in which any remedy might be applied, but had no special plan to propose as to what would be a substitute for it.

The CHAIRMAN: You also made an objection to 20 inhabitants endeavouring to set the Act in motion, but you did not tell us what you would substitute for the 20 inhabitants.

Mr. CRIPPS said he was not prepared with any definite plan. He thought the 20 inhabitants required alteration, and he thought that any inhabitant who thought that the water was bad ought to be able to have somebody to whom he could readily apply.

The CHAIRMAN: I only want to know whether you have any definite proposal, or whether you intend to leave it to the committee upon the evidence.

Mr. DENISON: I certainly intended to admit that any person who thinks that the company has done him an injury should have somebody to whom he could at once apply. That would be a very great advantage.

The CHAIRMAN: The great objection is that the 20 inhabitants would have to pay the expense.

Mr. DENISON said he did not think that was the case.

The CHAIRMAN: But it would be no use having an investigation if the chemists both came to the same conclusion, unless you had the counter evidence of counter chemists.

Mr. DENISON said he understood that the Board of Trade appointed chemists, and in that case they took all the expense.

The CHAIRMAN: I believe they did in this particular case, but they are not bound under the Act, and I do not know that they had any authority to do it.

Mr. CLERK stated that there had been a monthly examination going on for years under the authority of the Privy Council.

Mr. DENISON: Would you ask my learned friend how he gets over the difficulty about the expense, and whether he proposes that we should pay the costs, or those memorialists?

The CHAIRMAN: He has left it to the committee to discover what is to be a substitute for the 20 inhabitants.

Mr. CRIPPS said he declined to answer this same question from the honourable chairman, and he should decline to answer his learned friend. He instanced something of the nature of what they had provided in the Metropolis Gas Act—some individual whose duty it should be to inquire into the matter.

The CHAIRMAN: That is not a very effective suggestion, seeing that there is a committee sitting in the next room to discover what is to be done there, and they probably will make some reference in that committee to us.

Mr. CRIPPS: Probably in that committee, in the promise for appointing a person of that kind, the gas companies had a very important hand in framing the provisions of the Water Act. Of course that ought not to be. It reads all very well to set the Attorney-General in motion upon informations and injunctions, and so on, but it would not work. Some accessible tribunal was required, and one which could at once decide the matter which came before it. It was of no use to tell the parties that a remedy was open to them, such as that prescribed in this Act.

Mr. KEKEWICH said that he thought it was quite plain that the companies could not be compelled to give a constant supply unless they were furnished in some way with the means of preventing the waste of the water.

Mr. CRIPPS: Of course the important matter is to consider what course is to be adopted, and how far the waste can be prevented. These are matters upon which I desire to give evidence before the committee.

John Frederick Bateman, Esq., examined by Mr. WILKINSON.

I have been engaged as a water engineer, and in constructing works for the supply of water to towns, for nearly 30 years. During that time I have constructed, either wholly or partially, the water-works of 25 or 26 different towns and cities, the gross population of which amounted to upwards of 2 millions. Besides that, I have been engaged in constructing other water-works, and have been consulted upon very many other water-works in the kingdom. My experience commenced principally in the north of England. At that time the question of water supply was in a very crude state indeed; at least, it was limited in quantity, and there were many towns which had not at that time any regular supply of water at all. At that time the constant supply system was commonly adopted. The intermittent system of supply was scarcely anywhere adopted; nowhere, I believe, except where the water had to be pumped. Wherever water was supplied by gravitation 30 years ago, in the north of England, it was supplied upon the constant supply system.

The CHAIRMAN observed that perhaps care would be taken, in order to prevent their getting into confusion, that the committee should have it distinctly stated whether it was a direct constant supply, or a constant supply with intermediate cisterns, or any other apparatus, as the learned counsel went into each case.

Mr. WILKINSON: Is it the fact that out of the 20 towns which you have mentioned as having been supplied by you, there are but three which at the present time give an intermittent supply of water?

Witness: Three, I think, only, that I am immediately connected with; and I think not more than 200,000 persons, out of more than 2 million persons served by the water-works that I have been connected with, are supplied upon the intermittent system, and those were towns in which the water-works existed upon the intermittent system before I was consulted upon the subject. They are Chester, Birkenhead, and Belfast. In Belfast we are now constructing new gravitation works, and as soon as they are completed the intermittent system will be abandoned. With regard to the towns of Manchester and Glasgow, I have changed their mode of supply from the intermittent to the constant system. I have also changed the towns of Wolverhampton and Stockport. The pamphlet from which a passage was read by Mr. Cripps, as to my opinion of the question of constant supply, was read by me at the request of the Society for the Promotion of Social Science, at one of their meetings. I take no credit, however, as stated, of being the discoverer or originator of the constant supply system. I found the system existing in my earlier experience; I knew no other, and never attempted to carry out any other. The pamphlet contains the result of my experience and my deliberate judgment.

Mr. WILKINSON: You state that you think it is a delusion to believe that the consumption under the constant supply system is so great that no company or water-works can meet the demand. I will ask you to give the evidence of your experience in the particular cases where you did inquire, and give me the statistics of the water supply in some of the manufacturing towns of Lancashire and Yorkshire.

Witness: The general consumption of water in the manufacturing towns of those counties, which include a very large population, is from 16 to 21 or 22 gallons per head per day, including the supply of water for all purposes. In Manchester, where the supply has been constant and unlimited since about 1852, the supply is about 21 or 22 gallons per head per day, and of that one-third or thereabouts is supplied for trade purposes, leaving the actual supply for domestic purposes about 14 or 15 gallons per head per day. At Preston, Blackburn, Bolton, Stockport, Halifax, Warrington, and almost all the other manufacturing towns in the north of England, that is about the average consumption; upon the constant supply system. It is 15 gallons per head per day for domestic purposes; or for domestic purposes, eliminating trade purposes, it would be about from 12 to 15 or 16 gallons per head per diem. By domestic purposes I mean for all purposes except those which may be called directly trade purposes. The quantity of water which is supplied to Manchester is about 13 million gallons a day. The population supplied is from 600,000 to 650,000 persons, and out of the 13 million gallons per day the present quantity supplied for trade purposes is about 4,200,000 gallons, and the difference is that which is supplied for all other purposes. I do not include in trade purposes watering the streets, &c., in the borough of Manchester, because the supply there is in the hands of the corporation, and they would not charge themselves with the watering of the streets; but the water which is paid for, and returns a rent from the water consumers, amounts to £4200. The quantity for which rent is paid amounts to that, and of course street watering would be additional. Street watering would be included in the 14 or 15 gallons per head per day; indeed, that is one of the common purposes of a town, and ought to be included amongst them.

The CHAIRMAN: In fact it is for all purposes, except for manufacturing purposes, which is measured by meter?

Witness: Yes, except that all stable and other purposes connected with town use are included in the residuum.

Mr. WILKINSON: In Manchester you assume it to be one-third for trade purposes?

Witness: It is not a matter of assumption; 4,160,000 gallons is the total quantity consumed for manufacturing purposes, or about one-third of the gross supply—4,200,000 gallons, or nearly one-third of 13 millions.

Mr. WILKINSON: Does your estimate of the rate in other manufacturing towns exemplify what you have stated?

Witness: No; I know it by actual measurement in many other towns. In Halifax I know the exact quantity of water which is used for trade purposes and what is left for domestic purposes, and the same in many others.

By Mr. WILKINSON: The trade consumption varies with the character of the town. Manchester was formerly supplied on the intermittent system, and about the year 1851, or 1852, or 1853, it was entirely changed to the constant system. Manchester was divided into districts, over which a very careful supervision was established, and every approved appliance for the supply of water was compulsorily introduced, and as the districts became accustomed to the new state of things, it was gradually put on, till it became a permanent supply upon the constant system. The owners or occupiers may introduce cisterns or not as they choose. The water is supplied under three different pressures. There are three zones of supply, according to the varying elevations of the districts. The pressure varies generally from 70 to 80 feet to 150 or 180 feet. The larger houses are supplied in the ordinary way, either by cisterns or not, because a cistern is not a necessary piece of the apparatus, except to the water-closets; the smaller houses are universally supplied without cisterns, and in the very poor parts of Manchester, where the houses are clustered together without conveniences for taking the water into the houses, stand-pipes, or wall-plates, as they are called, are introduced, which are the property of the corporation, and to which everybody has access. The corporation there stands in place of the water company, and everybody is entitled to have water, and everybody is compelled to pay for it, whether they have it or not. I believe the communication-pipes in Manchester are laid on by the corporation; that is the custom of most companies, indeed it is the habit of the country generally; and from the wall of the house into the interior, and all the appliances in the interior, are at the expense of the occupier or owner. The ordinary cistern-pipe is half an inch in diameter, or from 3-8ths to half an inch; a large house, under the constant supply system, requires no more than an inch communication-pipe. I endeavoured to introduce a custom that the corporation in Manchester should be its own plumbers, as most companies are, for the purpose of securing the best workmanship and the best description of tap or valve; but that was slightly relaxed in Manchester until they came to authorizing a certain number of plumbers, who were bound to adopt certain rules and to introduce pipes at such a strength, and taps and other appliances of such approved construction as the corporation determined.

The CHAIRMAN: Now will you give us a description of the apparatus within the house?

Witness: If you take the lower orders, it costs nothing more than the expense of one tap in a cottage house—I mean that there is a half or three-eighths of an inch pipe leading into the house with a tap on it. In many houses in Manchester the pipe is taken down the passage which commonly exists between a lot of cottage houses, and so introduced from the back, with a stand-cock, and the water-closets of the houses. A certain number of the houses are commanded by this stop-cock, where it is taken from the district main, and those houses are dependent upon their water coming through that particular pipe. In case of alteration or addition, the water has to be shut off, so that a number of houses would, for the time of the alteration, have their water supply suspended. Where the tap is in the house it is over the sink in all cases. They are not common taps, but screw-down taps of the best possible construction. Nothing but supervision can prevent them leaving the taps open and the water running to waste down the sink. We do not find, either in Manchester or any of the towns where the constant supply has become a custom, any material amount of waste where they can always get the water. Under the intermittent system it is very different.

By request of Mr. WILKINSON, the witness explained the taps used in Edinburgh. One was a common ground tap—simply a plug with a hole—and the other was a screw-tap, in which there was a loose valve, and the water coming through there is screwed down by a little bit of leather. *Witness* continued, in answer to the CHAIRMAN: There is scarcely any supervision in Manchester; so accustomed are the people to water, and so unnecessary do they find it to let their taps run, that they merely draw the water when they require it. I do not find that taps are stolen in Manchester more than in any other town. They are generally in a room, and not in an open place. Nothing but the wall-plates are exposed. Taps exposed in the outer courts would be liable to freeze and burst, and therefore that is always avoided. Wall-taps are secured in the wall against frost or thieves. I cannot tell you now what plan is adopted specially with regard to water-closets. I know that the rule is that every water-closet should be provided with a cistern. There are not water-closets in the very small houses in Manchester; there is generally a privy or a dust-bin in the back yard. Amongst the upper classes of course it is universal.

By Colonel HOGG: A cistern without a waste-pipe would be an intolerable thing, because the ball-cock might get out of order by accident, and the premises would be inundated. In Manchester it would take perhaps 18 months or two years gradually to introduce the constant supply. I have never heard any complaints there as to the expense, or of misuse or mismanagement. Everybody being entitled to the water, there is no stealing there. The cost of supplying a cottage house with water all through that part of the kingdom is from 12s. to 15s. a house for the whole house, including labour and everything. I do not think there was any change made in the communication-pipes when the system was altered. A few pipes might have burst, but there was no systematic change in the pipes, although the pressure was immediately increased 70 or 80 feet over the whole district. I am told that the leaden pipes used in London are as strong and as heavy per foot as those which are used in Manchester. Half inch pipes are in general use in the north of England—about 6 lbs. per yard. The new pipe used in London would certainly be a drawn pipe, and not a cast one.

By Mr. WILKINSON: When the water was introduced into Glasgow—which was partially an intermittent supply and partially a constant supply—the pressure was increased at least 100 feet over the whole of the city; and although here and there a few pipes may have burst, there was nothing like a general alteration whatever. Here and there defective pipes told their own defect, and had to be supplied; but there was nothing like a complaint of the alteration or of the cost, nor was it necessary to make any extensive alteration.

By Mr. BAILLIE: I am the engineer of the works for supplying Glasgow with water. The consumption there is extravagantly great—about 50 gallons per head per diem. I may mention, perhaps, that amongst the places that I have been supplying with water are St. Helen's, Macclesfield, Blackburn, Ashton, Darwen, Kendall, Stockport, Manchester, Glasgow, Gloucester, Stirling, Belfast, Birkenhead, Wolverhampton, Newcastle-upon-Tyne, Chester, Warrington, Halifax, and many other places besides.

By Mr. WILKINSON: A new tap must be introduced in all cases before a constant supply was given. The cost would be only from 1s. 9d. to 2s. 6d. If the old pipes could be conveniently removed, those pipes being larger now, and therefore heavier per yard than those which would be needed under the constant supply system, most likely the money obtained for the old pipe would pay the whole cost of the new, and in some cases more than that. I consider the evidence as to the cost averaging £8 or £10, or even £12 a house, a very exaggerated estimate. Mr. Morris gave two instances—one of a six weeks experiment, and another of a twelve months experiment, and he spoke of the bursting of pipes, but I am quite sure that if the bursting of pipes had been general it would have been utterly impossible to have continued those experiments; there would have been such an outcry on the part of those who were supplied. The bursting of the pipes must have been very small in proportion. Plumbers generally put in as heavy pipes as they can when it is left to them, and therefore the probability is that the pipes were strong enough in most houses. I do not concur in the opinion that it would be necessary to entirely refit a house with new pipes, caps, and everything else, and that they would cost £8. The mere introduction of a pipe without a water-closet in the poorer houses would not be more than 15s.; call it £1, and the water-closet additional need not be more than another £1, so that £2 would be sufficient for a vast number of houses, with a new supply entirely, and a water-closet. Very considerable power ought to be given to somebody in the passing of a bill for the purpose of seeing that the pipes, and everything that is used, is of the best construction, that the work is properly done, and also for preventing waste. I am the principal engineer of the water-works at Newcastle-on-Tyne. There the water has always been delivered on the constant supply system, but the consumption gradually increasing to an extravagant point, a vigilant inspection was introduced, and means taken for checking the wasteful expenditure of water, sufficient powers having been granted to the company by a recent Act. Mr. Main, the manager, reports to me that the gross daily consumption is 30 gallons per head, of which 7 gallons go to manufacturers and trades. Considering 23 gallons per head to be excessive for domestic consumption, he was anxious to ascertain precisely where the water went to; for this purpose he had the town divided into small districts of three or four streets, completely isolated and put in a street meter to register the daily consumption. On comparing the results in districts where water-closets prevailed with those in which there were none, or comparatively few, it was soon apparent that the water-closet—generally from being out of order, but in several cases from the crank-handle being purposely propped up—was the great consumer. In the upper portion was a district supplied with water-closets varying from one to 4 persons to one to 12 persons, the average probably being about one water-closet to every 6 persons. Those were the better class of houses, and the consumption varied from 55 to 80 gallons per head per day. The other houses were smaller, where there were few water-closets—one to 35 inhabitants in one case, one to 48 in two other cases, and one to 157 in the third case, and there the consumption varied from 11 gallons per head per day where the water-closets were fewest, to 30 gallons per head per day where they were the most numerous. Mr. Main's report goes on to say—"In order to stop so flagrant a waste, we set on a staff of men to examine every water-closet and tap, and report thereon, leaving a notice that, if not put in order within three days, the supply would be stopped. After the lapse of three days, another set of men followed, inspecting those places reported as leaking, and shutting off the water where the notice had been disregarded. In this way we stopped an immense waste, the effect being immediately apparent in increased pressure throughout the town; but that measure was only for a temporary purpose, and could not be relied upon to effect any permanent saving; and for upwards of 12 months we have been going on systematically replacing the present water-closets with Guest and Chrimes's double-valve cistern and Thomson and Murray's valve cistern, neither of which can be propped to cause a continuous run. In this way we have reduced No. 3 district from 55 to 34 gallons per head; No. 5 district from 60 to 39 gallons; No 6, 61 to 25 gallons; and No. 7, 62 to 26 gallons per head. In carrying out the change, we occasionally meet with opposition, but not as yet to any extent. In one district we put new double-valve cisterns into every house by arrangement with the landlords; the result was as follows:—That from 32½ gallons per head per day the consumption was reduced to 16½ gallons per head per day; in another case the consumption per day before the improvement in the water-closets and taps was 31 gallons per head, and after the improvement it was 12 gallons per head. The general result of my investigation as to waste has been—that, where everything is in good order, there is no disadvantage to either party by the supply of water on the constant supply system, while the advantage to the consumer is comparably greater than can be enjoyed under the other system. If the regulations are observed as to waste, the constant system will consume no more water than the intermittent. Those who prefer to abandon their cisterns and take their water direct from the pipes, can do so at very little expense. Complaints of inconvenience arising from interruption to the supply of water are scarcely ever heard in towns where the constant supply is at work.

The CHAIRMAN: At Newcastle there would seem to be necessaries or privies that are common to large rows of houses.

Witness: I had occasion to inspect that town under the Royal Commission, to inquire into the outbreak of cholera there, in 1854; and I am sorry to say that it consisted of 90,000 people, and 60,000 of them were without any provision of that kind; they had no private privy of any kind whatever. There were no privies in the courts in which the people lived. There certainly were not half a dozen public privies in the town, and 60,000 persons out of the 90,000 had no privy or water-closet accommodation of any kind.

The CHAIRMAN: What arrangement is there where there is a privy for several houses? Is there a cistern immediately to flush it?

Witness: No. Ashes are put into it, and the soil is removed. There is no water-closet cistern amongst the lower classes. In the Newcastle and Gateshead Water-Works Act, 1863, there are important clauses having reference to the considerable powers which are vested in the company for the purpose of introducing the best kind of water, and giving them the power to cut off the water in case their regulations are not complied with. At Chester they have been induced to change the constant to the intermittent supply. The water is pumped from the Dee, and it is an old-fashioned directory. They commenced the constant supply, but having taken no very special provisions to provide for it the waste was very considerable, and after some time they abandoned it. They now give a very continuous daily supply through the Dee. In Glasgow the waste is very great. Water-closets are almost universal there. The plumbing is very bad there, and it is the practice of the plumbers, in order to let the water

run to waste in the cisterns, to introduce what are called "deafeners," which are rags attached to the waste-pipe to prevent people hearing that the water is running to waste. I have done my best to arrest the waste there, but they have as they suppose an inexhaustible supply from Loch Katrine by gravitation. It costs them nothing, it washes their sewers, and it sweetens the Clyde. and therefore they allow it to exist.

In answer to Mr. BAILLIE, *Witness* said they were now only bringing about 22 million gallons a day from Loch Katrine, and it is fuller than ever it was. They had power to draw 50 million gallons a day.

By Mr. WILKINSON: Shortly after the introduction of the water from Loch Katrine it was found that the waste was 7,200,000 gallons a day there. Many single taps ran 800 gallons a day to waste, and that had been going on for years, perhaps for want of inspection. My deliberate opinion is that if in this great metropolis the providers of water and the consumers will each do their duty, and work harmoniously together, the citizens may enjoy the inestimable benefit of an unlimited supply of water constantly laid on, without consuming a gallon more water, if, indeed, as much as is now supplied by the water companies. I think the constant supply should first be made imperative, but sufficient time should be allowed the companies in all cases to prepare for it. The companies ought certainly to have very large powers, and perhaps there ought to be a court of appeal also. It is not necessary to provide a cistern to a house under the constant system, except for water-closets; but it is desirable and convenient that cisterns should be introduced if possible into large houses. It is not necessary that every house should be separately connected with the company's mains. Groups of houses belonging to the same owner might have one connexion, and the pipe might go from house to house. It is necessary that the supply to every water-closet should be regulated by means of a water-waste preventer of approved construction, and that all service-pipes should be of sufficient strength to bear the increased pressure consequent upon the alteration in the mode of supply. It is quite necessary that the company's inspectors, or the water police under the Metropolis Water Act, should have power to see that the fittings are in proper order, and no waste allowed; and where waste was allowed to summon the parties before the magistrates, and have the fine authorized by the Act imposed.

In answer to the CHAIRMAN, *Witness* said that in Glasgow and Edinburgh there was a system of water-closets throughout the small houses. He did not think that, as a rule, there were water-closets to houses of £8 or £10 value in towns with which he was acquainted

By Mr. WILKINSON: There have been several arrangements by which waste is prevented, and several cheap modes of preventing it. I think that in all cases where water can be wasted by negligence, it is desirable to introduce arrangements of some sort for the protection of the companies, and that they ought to be introduced at the expense of the consumers. There would be no difficulty, as far as the mechanical apparatus is concerned, in introducing something which would be quite efficient. I do not know that I can tell the precise mechanical arrangeme ts, but I know various water-closets with arrangements by which the waste of water is prevented. The subject of protection against fire has occupied my ttention very carefully for the last 20 years. The plug system in London is a disgrace to our profession, and to the mechanical ingenuity of the age that it should be allowed to exist. I would suggest improved fire-cocks, which have been largely used. I believe, at present, there are about 120,000 fire-cocks employed, on a pattern which was introduced first in Manchester, by which immediate communication is had with the pipe, and which cost probably, after the whole expense is included, about 30s. a cock. It is only suitable for the constant supply. I concur with Captain Shaw in thinking that constant supply is necessary. In almost all the cases where I am engineer the fire-engine has been discontinued. The water is obtained from the main-pipes almost instantaneously, and the fire-engines are merely used as omnibusses to carry the men and their apparatus. I see no difficulty in introducing a system like that in London. I cannot understand the estimates which have been sent in, and laid before this committee. I see it has been estimated that it would cost £10 per hydrant, and that £150,000 expense would have to be incurred in changing the hydrants belonging to the companies. I should be very glad indeed, if I were a contractor, to undertake to change those hydrants at £2 a piece instead of £10. My estimate is based upon the new fire-cock which has been introduced in about 150 different towns. It is a cheaper thing than Captain Shaw's. It has been used for 18 years, and answers perfectly. My estimate included the cost of digging up and relaying the road—everything. I have changed hundreds of them, from the old wooden plug, in Manchester, to one on a better construction, at a cost not exceeding 30s.; that includes the fire-cock itself, the attachment of it to the pipe, and the box—the street casing which covers it and protects it from injury. It goes by the name of Bateman and Moore's patent. It was invented, principally, by one of my own pupils, and I improved upon it, and for his sake I took out a patent, which has been very successful. That was in 1847. The patent has long run out. It consists of a vertical pipe coming from the main, or from a side branch with a swelled part, in which a gutta-percha ball rises with the water and closes against the outlet; it has then two lugs rising from the mouth which enable a vertical pipe, called a stand-pipe to be introduced and attached, and then by screwing down a handle which has a cup at the foot of it, which fits the top of the ball, the ball is depressed, the water rises round the ball in the swelled part, passes up the hollow stand-pipe, and so through the hose, and is thrown upon the fire. They are scarcely ever out of repair, and the attachment is simple. A certain head of water is required to make them available for putting out a fire. Where there is pressure enough you can do without fire-engines.

Cross-examined by Mr. DENISON: Captain Shaw's scheme is different from mine, but I do not know in what respect at present. Captain Shaw knows mine well. The estimate of £10 a cock is Mr. Quick's, but I do not know what it is founded upon. From 150 to 200 feet would be a desirable pressure to enable them to do without fire-engines. I do not agree with Captain Shaw that 300 feet is necessary. I have a respect for him, but I do not accept him as an authority for fires. I have had to provide apparatus for many more towns than Captain Shaw has. A ¾ inch pipe, adapted for a constant supply, ought to weigh about 10 lbs. per yard. In building houses the water companies ought to prescribe the strength of the pipes to be used, and not the builders. An officer from the Board of Trade ought to be the party to appeal to, one who is specially educated in the matter. A Captain Tyler kind of man would suit me, but I think he would be too good for the purpose, because his time might be employed upon questions of greater interest. There ought to be provision made for the summary conviction of offenders. The rate of penalty for the first offence in the Newcastle Act is £5. The clauses in that Act are very good. The only material provision which I would recommend in addition would be that the public also to some extent should be protected by some kind of appeal. Things always have gone on smoothly at Manchester as far as water was concerned. The corporation there are satisfied, and there is very little waste.

Mr. DENISON read a notice from Mr. Heron, the town-clerk of Manchester, cautioning people against allowing water to run to waste.

Witness: That is a very proper notice to issue from time to time, even if the waste were very inconsiderable.

Mr. DENISON: Do you think that people in London would be very much inclined to submit to what you call severity?

Witness: If it is necessary in order to correct an evil habit it ought to be adopted.

Mr. DENISON: You see we have got people to deal with here who have heard more than complaints; they have heard that which you have proposed, and you propose a system of what you call "the most persevering attention, and indeed severity." Do you not think that possibly there might be a good deal of remonstrance?

Witness: That would not signify; it would only be remonstrance on the part of those who deserve to be severely treated. It is necessary to be severe with criminals; you cannot keep the peace of the country without occasional severity.

Mr. DENISON: Do you think that the term "criminal," for which I am obliged to you, will be forgotten when the time comes?

Witness: I am quite content that it should be remembered. I only use it as an illustration.

Mr. DENISON: At Chester you say they failed because they were old-fashioned?

Witness: Yes, they are rather old-fashioned there.

Mr. DENISON: In fact they are old-fashioned and good-natured, not severe.

Witness: That is so.

Cross-examination continued: Glasgow is a specimen of what naturally does happen when stringent measures are applied. I have not gone into the matter of estimates for cisterns. In small houses I would not introduce cisterns at all. I think that for small houses, if cisterns are held to be necessary, the cost need not exceed £2 or £3. The whole cost, including the water-closet, except the apparatus of the closet itself, need not amount to more than £1 or £2. Under the constant supply system for smaller houses I would propose merely a communication-pipe, with as many taps as might be required for the accommodation of the house, and nothing more; except that, where a water-closet is introduced, there should be a cistern to the closet, and that should be upon the principle of preventing waste—one of those things which is called a double-valve service, or its equivalent. My animosity against cisterns does not increase with age.

By Mr. KEKEWICH: In many cases, one large cistern for a block of houses would be very desirable. I have had very little to do with the intermittent system; 1,800,000 people out of 12,000,000 whom I have had to supply with water have been supplied under the constant system. I have no doubt that plan would be desirable in many cases where cisterns were required.

By the CHAIRMAN: I think that every water-closet ought to have its own cistern, if it is supplied upon the self-regulating system. It would be necessary with the constant supply system to have a double valve to each closet, or an equivalent, by which the water should be prevented from being wasted.

Mr. DENISON: At the same meeting of the Social Science Congress where you read your paper, Mr. Beggs read one subsequently, in which he says—"It is well known that the negligence and dishonesty as to brass fittings are most flagrant. For the sake of a copper ball or a brass service-cock, which may be sold for a few pence, they will be torn from their places, and the other parts of the service seriously damaged, so that the water runs to waste, and so continues for days, until detected by an officer of the company. An intelligent audience would scarcely give credit to a report, if such could be made, as to the extent of mischief of this kind." Do you agree with that?

Witness: I have no means of disagreeing with it; but it surely cannot apply to all the houses of respectable artisans and mechanics of London. I should not give the chance of stealing; I would put them a wall-plate or a stand-pipe in the street, of a kind which would not be worth carrying away if they even did steal it, or it should be so fixed that they could not steal it

The CHAIRMAN: Would those double-valved cisterns enable an ordinary necessary to be flushed by a mere turncock, without all the apparatus of a water-closet?

Witness: I should think a simple arrangement might be made for doing it.

Mr. DENISON: I hear something which will horrify you: that even in Manchester they are obliged to chain the butts up to prevent them from being stolen.

Witness: That is possible; there are dishonest people all over the world.

Mr. DENISON: Supposing they were to say that they did not care for the water. You know that at Manchester everybody has to pay, whether he takes the water or not.

Witness: Yes; that is one of the difficulties of companies having to deal with so large a place as London. It comes to a question whether the companies ought to be here at all or not. I should certainly make it incumbent upon the companies to give a constant supply within a limited period. I would give them full power to refuse water to everybody who had not their fittings in proper order, and summary powers—or at least the means of putting into action summary powers—for the punishment of those who stole water or sold it. Of course the companies have to be protected; it is an unfortunate position where the interests of the consumers and the proprietors are antagonistic, as they are in the case of supplying water. Everybody ought to have the command of the water.

By Mr. KEKEWICH: In the towns I have mentioned, which are supplied under the local Acts of Parliament, inspectors are always appointed. The companies appoint them, but water companies are rapidly disappearing; their works are now being purchased by corporations, and the distribution is carried out by them.

By the CHAIRMAN: The turncocks now employed might, if the constant supply system were adopted, be turned into inspectors. I do not know any town quite parallel to London; and in Glasgow, which is, perhaps, the nearest approach to it, it is quite shocking to see the waste that is carried on there. In Glasgow they have on each floor mere taps without any cisterns; and that is the condition of things that would be in London if you suddenly changed from the intermittent to the constant system. I do not think they have tried the system of ferrules in Glasgow, with the view of preventing the enormous waste, or the system of a double valve-chamber over the water-closet. They have gradually been introducing changes into the water-closets, and they have made very considerable improvements which have had a sensible effect. It diminished the water for a time, but then nobody took any interest in it, and Mr. Gale, the engineer, relaxed his

efforts, and the thing is going on pretty much as it was. So long as they have something like 30 million gallons of water a day more than they actually require, and which will cost them nothing but a little extension of piping, they do not feel it, therefore they allow it to go to waste.

Mr. KEKEWICH: Is it your opinion that you cannot reduce the waste at Glasgow without introducing the ferrule into every cistern used for the purpose of domestic supply, and the double valve-chamber into every closet?

Witness: I will not say that, but the present consumption per head in Glasgow is about 50 gallons, and I have no doubt whatever that persevering efforts to reduce the consumption, to economize the water, and to introduce the best class of fittings, would reduce the consumption certainly to 30 gallons per head. I am quite sure that 20 gallons per head might be saved in Glasgow after a lapse of a couple of years, which would be required to carry out the necessary operations. When I speak of introducing the best class of fittings, I mean by taking out the objectionable ones and putting in fresh ones. I mean taps, ball-cocks, and everything. I have here a report, dated September, 1864, and at that time—which was about 2½ years after the introduction of the water from Lock Katrine—out of a total of 165,000 water-fittings of various kinds which had been examined, 67,000 were not approved of; 41 per cent. of the old water-fittings at that time were objectionable fittings, and they were gradually removing those objectionable fittings, and introducing better ones. I think it necessary to prescribe the patterns of the fittings, and if plumbers generally are employed, to compel them, under penalties, to use them according to that particular pattern or standard. I should seek for power to license plumbers. I think that some addition to the Newcastle clause might be added, to that effect to license plumbers, who should be compelled to use such fittings as might be prescribed by the companies or by the corporation, and that nothing else should be allowed.

Mr. BENYON: If the companies were to prescribe the weight of the pipes, the nature of the fittings, and so on, of course the expense would be upon the consumer.

Witness: Yes; but the consumer would have a great advantage in getting a constant supply instead of an intermittent one.

ELEVENTH DAY—WEDNESDAY, JUNE 5.

Mr. CRIPPS stated that the report of Captain Tyler was taken as put in. He would not trouble the committee with further evidence upon the points to which it related.

Alexander Ramsay, Esq., examined by Mr. CRIPPS.

I am the manager of the Edinburgh Water Company, and have been so for about the last 23 years. Before the year 1852 that company supplied upon the intermittent system. Our new Act in 1847 gave us five years, and after that we were to supply upon the constant system. In making that change in 1852, I think we laid out in enlarging our mains, and in other expenses, some £10,000 or £12,000. Our supply at Edinburgh is a supply entirely by gravitation, the water is not mechanically raised at all. That had been the case from the commencement of the company in 1819. With a few occasional unavoidable exceptions, arising from excessive droughts, we have been supplying upon the constant system since 1852. In the year 1864 the drought was most excessive in Scotland, and the consequence was that our reservoirs in the hills got almost all emptied, and we were obliged to reduce the delivery. We distributed the supply in the best way we could, but it was not a constant supply. Since the change has taken place in Edinburgh the system has been very much more approved than it was before—it has been altogether better. No one can have, in my opinion, any experience of the two systems without being able to appreciate the advantages of the constant system. There are difficulties to be overcome with reference to the prevention of waste. I do not think, as a common rule, that constant service is practicable unless a company has some very stringent power over the house apparatus. I think, with a proper control over the house fittings, and proper supervision in every way, you can give a constant supply of water with a smaller quantity than you can give a full intermittent supply. The whole power which we had when we first changed our supply, to insist upon improved fittings being put on, was the power granted under the "Water-Works Clauses Act, 1847," and those powers are very small. That Act was passed in the April of 1847, and I think our Act passed at the end of June or beginning of July of the same year. Although the General Act was only six weeks old, it was incorporated with our Act. After that we were forced to institute more strict supervision to prevent waste, or we could not have maintained the system of constant service at all. We were obliged to keep up a very strict inspection to prevent the waste from the water-closets. The people in Edinburgh, as in most large towns, have a habit of fastening up the handles of water-closets, and allowing the water to run through for days and days, and the waste there was quite enormous. We have now a staff of officers whose business it is to make inspections, and prevent waste arising from that or any other source. We got additional powers in 1863 when we were before Parliament, and we have introduced a better system of cocks and taps, but we had a great difficulty in getting them introduced. The plumbers in Edinburgh resist every kind of improvement in water apparatus. I tried for a great number of years to introduce the new system of tap—the screw tap—a loose valve screwed down. It is as cheap as the old system of tap; the only repair it can ever want is the replacing of the leather washers, which is a very inexpensive process; but the plumbers in Edinburgh are so very adverse to their introduction that I have found in several instances, in putting them on, instead of putting the tap down they kept it screwed up, and in attaching this by hot solder to the tap, the leather gets scorched, and that runs the tap. Then they appeal to the consumers, and say, "You see, this will not do; it is leaking already," when they have themselves destroyed it. That is one of the difficulties we have to contend with; but in order to show, by a convincing proof, what the waste of water from a very small source is, I had discs constructed a few years ago. One, the size of which is ·05, with 150 feet of pressure, discharged in 24 hours 1613 gallons; then another one is 1-10th of an inch, that discharges, in the same time with the same pressure, 2380 gallons. Now, going on to the others, I could not maintain the pressure in these experiments. I have got it down to 120 feet in 4-10ths of an inch, and through that there passed 34,280 gallons. That may give one some idea of the loss of water from having a tap open for a very short time. Just now our consumption in Edinburgh is 35 gallons a day—that is a very large supply. The service is on night and day constantly. That 35 gallons per head per day includes the supply for every purpose. We have arrived very nearly at the quantity consumed for purposes other than those for domestic use, and it amounts very nearly to 14 per cent. If we had the power of taking proper means to prevent waste, the consumption, with a supply equally full, and I believe most satisfactory, would be reduced to something like 18 gallons per head—not exceeding 20 gallons, at all events. The power I should require for that purpose would be the power of prescribing the description of apparatus and taps to be used, and we should take care that no water was supplied when the taps were not of the proper description.

By the COMMITTEE: A person could not leave this new tap open and the water running as well as the other, because this requires two or three turns to open it fully; and it has another most important advantage over the old system of tap—viz., in order to shut the water off that, it requires a half turn only to open it out, and the shutting of it quickly produces a shock in the interior of the body of the pipe; that shock disturbs the lead, and by-and-by that pipe gives way and you have a flood, but in this new tap there is not the slightest shock, it is screwed down so gently that there is not the least shock upon the pipe. We should take care that the house was examined constantly to see that it was supplied with the proper apparatus and taps. If in any case we found repeated derangements we should give them notice—say three days—to set it right, and if it were not done then we could not afford to go on—we must cut off the supply. I do not propose, in the first instance, to prescribe the exact form of tap to be used, because there may be an improvement upon that. I would scarcely even prescribe the improved form. I would exclude the objectionable form of tap most rigorously. We do not have people complaining that we inspect; our officers are sent more to make inspections for people who are disturbed by the noise of the water rushing in; they send to us to have it examined into. We have the power of inspection, but we have very little power beyond that.

Mr. CRIPPS: In your opinion, supposing the communication-pipe were sufficient to stand the pressure upon the intermittent system, need there be any greater pressure upon that pipe for the constant system?

Witness: There would be a difference, but I think that difference would be amply compensated in another way. When you turn on the water at the main, the shock of the water on the intermittent system rushing in with great force into the interior of the pipes weakens and distends them. That is avoided by a constant steady pressure; but that difficulty about the distention of the pipe is still further increased by the old tap, and you get quit of them both by using my new tap. I have no recollection of ever hearing of any alteration requiring to be made in Edinburgh to repair a house-pipe for the constant service. At the time the change took place the fittings which had been used for the intermittent system went on without change for the constant service, and for a long time we supplied in that way; and they are still the same in a great many cases. In introducing water for the first time into a house, you can introduce it at less cost on the principle of constant service, putting in proper apparatus; and the expense of maintaining that apparatus is very much less than the cost of maintaining the ordinary apparatus. Supposing a house to be already supplied with apparatus for an intermittent service, I could not give any idea what would be generally applicable as to the cost of putting the proper apparatus for constant service. In Edinburgh we have a vast extent of apparatus, much more, I think, than in any other town of the same character. The number of water-closets in use is enormous, and perfectly incredible. There are baths in the houses, even in houses of very low rents indeed, and the expense of the alteration would depend upon the present condition of the house fittings, and the character and extent of the apparatus in use.

The CHAIRMAN: When the change was made, did you dispense with the use of cisterns to any extent?

Witness: We had no power to enforce it, and the cisterns are in use now. I have recommended, however, in a great many of the houses already fitted for the intermittent system, where it could be done without inconvenience, that it should be dispensed with.

Mr. CRIPPS: When you are going to supply water for the first time to a new house, do you then have cisterns?

Witness: We do not object to the cisterns being put in. We have no power to object, but in the case of water-closets a cistern is indispensable.

The CHAIRMAN: In regard to the older houses, what is the character of the apparatus?

Witness: It is very ill constructed generally. I must say these water-closet cisterns, and the apparatus connected with them, are generally not too large. The water there is run off with great force and very suddenly, and a very small quantity of water in that case is sufficient; but when a cistern is erected in a house for the common purposes of the house, and the water is let down into the water-closet by a small pipe, they very often keep it always running there. It does no good. They have an idea that it cleans the drains, but the effect of it is only to fill the house with bad air.

Mr. CRIPPS: Take the case of a house the rental of which is under £10 a year to be supplied for the first time with a constant service, what is the expense in that case?

Witness: You could supply the house with a water-closet, and a small cistern for the water-closet, and a single tap placed in a convenient situation, I should think for not over £2; of course, it depends upon the distance from the main—the whole of the apparatus, the water-closet, the pipes, and the pipes of communication, and the cistern, for £2 10s. perhaps. It would be an iron cistern, to hold probably 5 or 6 gallons of water, that being constantly supplied on the usual system with double valves, so that letting out the water in the cistern you cannot get any more till you let go the handle and it fills again.

Colonel HOGG: Do you include the pan and everything in the figure you gave?

Witness: It is not a pan exactly that I am speaking of; it is a vessel made of crockery ware, with a bent pipe, and a knee upon it, going out into the drain. It has a handle to pull down, and the water continues to flow as long as there is any water in the cistern and the handle held down, but when the cistern is empty, you require to have it filled again before any more water flows. The cistern for a water-closet would be the same, or even more expensive with the intermittent system.

Mr. CRIPPS: Striking off the water-closet, which would be common to any system, what would you be able to put in a cistern for? Will you compare the same thing for a constant service and for an intermittent service?

Witness: There is no difference; the cistern would require to be larger for an intermittent service, but the intermittent system is not a very convenient mode of doing it; it is better always to have a supply of water at command. The cost, quite independently of the water-closets, is only the cost of the pipe and tap, and that depends upon the distance from the main. If the main is close at hand, I should think 10s. or 15s. would most likely do the whole job.

The CHAIRMAN: As a matter of fact, have all the new houses which have been erected since your constant supply was established been fitted with these small cisterns and double valves?

Witness: No, a very few only; the plumbers do not like them, because they never want any repair. The proprietor or builder of the house has the control of the matter, and he acts under the advice of a plumber.

The CHAIRMAN: Would you propose, as part of that rigid supervision you have spoken of, that those matters should be regulated by some authority?

Witness: I think you can have no better authority than the water company in the first instance, but to prevent the company acting oppressively in any way there should be an appeal. In Scotland we have an appeal to the sheriff (who there is a law officer) in all cases of that kind.

By Colonel HOGG: I do not see any objection to cisterns in larger houses. I think they are indispensable where you have baths and wash-houses and kitchen boilers, but I think they are scarcely necessary, except for the purposes of baths, and so on. When there are a number of baths in a house it is better to have a large quantity of water present, and have them filled quickly.

By Mr. CRIPPS: In Edinburgh we find that if a pipe is strong enough to resist the intermittent pressure with the ordinary cock I have mentioned, it is strong enough to resist the constant pressure with the cock I suggested as an alteration. The pressure there varies from 450 feet down to 4 or 5 feet. The town is built upon a very varying and uneven surface.

The CHAIRMAN: You have no regulating zones of supply. It is all supplied from one head and under one pressure?

Witness: It is not all from one head, but the different sources from which the water comes are made generally to work together.

The CHAIRMAN: How do they work together if there are different heads of water? One would suppose the highest head would prevent the water running from the lower.

Witness: No; we are careful about that, because we know what the effect upon our pipes will be. We have certain zones of supply with reference to the different heads of water. We connect our street mains together, as a rule, bringing the ends together, so that what is deficient in the pressure on the one may be made up by any excess of pressure on the other.

Mr. CRIPPS: With reference to your fire-cocks—how are those arranged?

Witness: The fire-cocks are placed upon the street mains at the cost of the police. We put them, I dare say, from 100 to 200 yards apart, but in some places they are much wider apart than in others. There is no very strict rule as to the distance, and the water company have no voice in it; it is all done under the instructions of the Town Council or Commissioners of Police. The kind of cock we have had in use up to recently—about two years or two years and a half ago—I think was the common ground-cock, a stupid apparatus, very costly, made of solid brass, and weighing from 60 to 70 lbs. each cock; and it very often happened, when the water was required for a fire, that the plug could not be moved in it, and the water could not be got. But I recommended, some two or three years ago, the kind of tap which you now find in use in almost all the principal towns in England, Bateman and Moore's patent, manufactured by Messrs. Guest and Chrimes. It costs about one-fifth of the other. The other costs something like £5. It depends upon the size of the main whether this is put on the main itself or on a branch put from the main to the side of the street, but when the main is very large we do not put it on that main; we take a branch from it to any convenient place. Of late years I have got them to put the fire-cocks on the largest mains they can get.

Mr. CRIPPS: With the fire-cocks that are used now is there generally a sufficient amount of pressure in the main for the purposes of a fire without any fire-engine at all?

Witness: Fire-engines have scarcely been used, to my knowledge, for the last two or three years. We have had some serious fires in that time, but the pressure on the main has been sufficient, and the water has been forced on to the fire by the pressure from the main; the hose has been screwed into the main, and that has been found quite satisfactory. With reference to the cisterns, we allow a waste-pipe from the cisterns and baths, because we cannot help it; but those waste-pipes are the source of enormous and incalculable waste of water. The cisterns are generally stuck in out-of-the-way corners where nobody can reach them, except a chimney-sweep or plumber, or somebody like that; they are allowed to run there, with their balls remaining downwards, for weeks and months continually. We have sufficient power of inspection with reference to that, but we have not authority enough to compel the necessary change to make the constant supply system thoroughly effectual.

By the CHAIRMAN: We have no power to cut off the cistern and make a direct delivery by tap, nor the power to remove waste-pipes. Those waste-pipes remain now, in many cases, as they were when the intermittent system was applied.

Cross-examined by Mr. DENISON: I know they have a waste-pipe in other places, but I do not think it is a very good rule to go by. The proper way to have a waste-pipe is to bring it into sight somewhere. I do not think you could do very well without a waste-pipe. A waste-pipe is connected with a cistern, and nothing else. The taps are frequently over a sink. Some houses have them without being over a sink, in a lobby. When there is a sink they generally contrive to put them there, and very wisely, I think. The corporation had to do with the supply of water to Edinburgh up to the year 1819; they have not since then. It was the company that changed the service from intermittent to constant, in 1852, and they got the improved Act with more power in 1863. The weight of the pipes that I have had prescribed since the passing of the Act, in 1863, is 6½ lbs. for ½-inch pipe per yard, and for ¾-inch pipes 9 lbs. With reference to the service-pipes, I do not think there was any rule, and before 1852 I do not think the company interfered much with them. The plumbers generally put the pipes in very light, but we have had very few accidents; they must at all times have been sufficient to bear our very high pressure. The pressure is great enough to work the pipes as fire-engines, without any machinery. When the fire-cock is put upon a small main, we generally contrive to turn on an additional supply of water to it with greater force; they get more pressure by that means. We have no pumping, it is all gravitation; that applies to all parts of the town, and even the suburbs. Leith and Portobello are all supplied by way of gravitation, to that extent that we can throw water to the top of a house. We have no steam-engine, and no pumping power of any kind. We deliver, I think, at a height of 450 feet above high-water mark. We have one reservoir at a height of 760 feet, and another one at a height of 545 feet. If the castle got on fire there would be no difficulty in putting it out, as far as the water is concerned; there would be a great blow-up when it caught the gunpowder, no doubt.

Mr. DENISON: You gave my learned friend a figure for the cost of changing your supply. I think you a little understated it, because when it was nearer the time you told Parliament that it cost £10,000 to make the change in one year, and £15,000 altogether.

Witness: I am speaking from memory now. What I said then is more likely to be right than what I said just now. I think the population of Edinburgh, Leith, and Portobello then must have been something like 190,000.

Mr. DENISON: Supposing you have a constant supply without any cisterns, how do you manage in case a main wants repairing—the water, of course, has to be turned off?

Witness: That is a thing that occurs very rarely indeed. If a main is in a proper condition at the time it is laid, and is properly laid, you may say it never wants repairing. We have mains there nearly 50 years old, and I have had them taken up, and they were as good as when they were laid down. Supposing we want to solder a new pipe into a main, for a common extension or service-pipe, we do not require to turn the water off. We have an apparatus for the purpose. Upon the end of the ferrule is a cock; we put that in, first drilling the main, and then when you are almost through the iron, apply the screw of the ferrule to it and screw it in, and the cock is shut all the time you keep it shut. It is a recent invention, and a most capital thing it is. Whenever there are repairs wanted upon a district main all the houses upon that district main would be all the time deprived of water. I am not in favour of cisterns only to a certain limited extent; they are indispensable where there are water-closets, baths, and kitchen boilers. Very often in a small house the general draught of water is from the same cistern as supplies the water-closet; but it is an error.

Cross-examined by Mr. JOHNSON: The quantity to each person per head during the intermittent supply was very low in some years, but we have been increasing the quantity from time to time for a great number of years past. I cannot give you the exact amount supplied before the constant system in 1852. The supply has necessarily been considerably in excess, since the constant service, of what it was under the intermittent service; because under that system they did not get enough—they had not water to give. Our source of supply at Edinburgh is from the Pentland Hills. We are bringing in now about 800 cubic feet per minute; of that there would be 470 or 480 of pure spring water that never saw the light. That is from an elevation which will supply the water to every variation of level in Edinburgh itself. We have no less than eight reservoirs at different levels on the hills. We have only one distributing reservoir in Edinburgh itself, and that is on Castle Hill; it is 315 feet above the tide level. As regards the principal reservoirs, the supply being entirely by gravitation, it is from reservoirs made in the hills at some distance from the city of Edinburgh; they are all at different distances, the farthest one just now is almost exactly 14 miles from Edinburgh, but that is a compensation reservoir for the spring water, which is taken away from the drainage area, but the springs are all collected and carried past that in an aqueduct to compensate the millowners. That compensation reservoir is not at all available for the supply for the city, but some of the others are. The nearest that is actually used for the supply of the city would be about five miles, and the most distant would be about nine miles. The £15,000 expense is exclusively the expense that fell upon the company. I do not know that the owners of houses were put to any expense. That expense was incurred in enlarging the mains, for the purpose of adapting them to the constant service.

Re-examined by Mr. CRIPPS.

Mr. CRIPPS: Was it for your purpose—was it a general improvement of your pipes for that new system?

Witness: It was more for the new system; but we required extensions besides. After 1852 we gave an increased supply, but no part of that £15,000 was expended in that increased supply. There are two things in the evidence which I gave before, which are quite separate from each other: the one applies to the street mains, and the other applies to the construction of reservoirs in the country, and bringing in the water to the town. The £15,000 applies to the street mains, and does not include any of the increased costs of the reservoirs. We took the fittings as we found them, the same as had been adapted to the intermittent service, and went on with the supply of water in the best way we could, we had no power to compel any alteration. The necessity for turning off the water from our street mains, is a thing that occurs so very rarely that the effect of it is quite inappreciable in the way of inconvenience.

The CHAIRMAN: I think we understand perfectly clearly that, as far as the domestic supply is concerned, the water may be drawn direct by tap, without a cistern at all; but as far as the water-closets are concerned, it ought to be drawn from a small cistern with a double valve?

Witness: Yes, and a large descending pipe, which is a most important condition of it.

The CHAIRMAN: It has been stated before the committee that there is a disposition amongst dishonest people to steal these brass taps. Why are they made of brass?

Witness: I do not think there is any other metal you could make them of very efficiently. Iron does not make a good tap; but we do not suffer from their being stolen in Edinburgh—it never occurs. It would not do for the screw-tap to be made of iron. You can never get iron to work well; it rusts if it were coated with zinc. No coating, I suspect, would help you. I think it must be made of brass. We see spring taps in the streets; but I do not like spring taps of any kind. They are not very satisfactory things; they are very apt to relax, and you cannot trust them.

By Mr. CRIPPS: The chief loss from waste in the Edinburgh supply is from the cisterns, water-closet apparatus, and bad valves. The ball-cock remains down and the waste-pipe of the cistern gets overflowed, and it runs for ever. The people have the practice, too, of tying up the water apparatus in the water-closets, so as to let the water continue to flow. I think people are very ignorant of the fact that the effect of tying up the handles is to fill the house with bad air. The flushing is the thing that is required, and a very small quantity of water does it effectually.

By Mr. KEKEWICH: We have about a dozen inspectors appointed by the company through me. The company is a joint-stock company of shareholders. It is a very difficult thing to say how often the inspectors inspect all the houses. Each man goes over a certain portion every day, and makes a return of that to me, and that return is kept in a book; it may take him some months to inspect his district. I know exactly what has been doing, and what the state of matters is. We take information also from anybody we can get it from, and attend to it immediately. I have never known an instance of any respectable person making any objection to the inspectors coming into their houses. If we find the apparatus out of order we have a printed form, and we fill up that printed form, giving notice of the repairs which are required, and giving a certain time to have them done in, and we send back afterwards to ascertain whether it has been done. If the waste has been great, and no repairs have been effected, we turn off the water. We have the power of summoning them before the sheriff, but not before a magistrate. The landlords fit up the poorer houses with cisterns and taps, but not well; the apparatus is bad. Some attend to our recommendations, but others do not; we are defeated very much by those horrid plumbers, who are always in the way. Their business is to make money out of the repairs. Theirs is a very poor trade when they contract for new work, and there is very little profit, but the profit when they get repairs to do is enormous.

The CHAIRMAN: Could not three-fourths of the tap be made of iron without any interference with its working?

Witness: Perhaps it might. I do not know; a piece of it is now covered with tin. When the people object to putting their apparatus in repair we try to persuade them to do it, and if they are very refractory about it I would have the water turned off.

Mr. BAILLIE: That would punish every man in the house, where they live in flats, as well as the offender, would it not?

Witness: In a flatted house in Edinburgh we should try to cut off the water inside the house; we have the power of doing that.

The CHAIRMAN: Can you inform the committee, in a general way, to

what extent there are small houses in Edinburgh in your water supply district?

Witness: I think out of about 170,000 people who pay, in a population which I assume to be 200,000, there are 23,000 of very small rents—that is, rents not exceeding £6—and between that and £10 I think there are 11,000 or 12,000 more; so that a fifth of the whole population is under £10 a year rent. Those are not separate houses. We have no small separate houses in Edinburgh, but they are rented in flats, and separately assessed in flats. Each of those apartments, in many cases, is a separate house occupied by a separate family, and should have a separate supply. They do not all do it in that way; it is a very common arrangement to carry a pipe up to a cistern in the roof. Water-closets are very nearly universal in Edinburgh in all houses where they have a water supply. In some cases they have one for a flat, and in some cases for a tenement, but those are exceptional; the common case is, when you have a good flatted house, that you have one for each flat. There are many houses of five storeys high, where you will find four families on each floor, each of those families having a water-closet, and in some cases each family having a bath as well. Sometimes there is one cistern for each flat, but they have the supply sent in the first instance to the roof to fill a cistern of smaller or larger capacity, and then there are pipes bringing the water round, and branching off to the different floors, and supplying them in that way.

Mr. *Henry Tomlinson*, examined by Mr. WILKINSON.

I am the manager of the Cambridge University and Town Water-Works. Our supply there is, and always has been, under the constant system. Our average pressure is about 120 feet. The consumption, at first, was very great indeed. In the first half of the year 1865, the gross consumption per head per day was 31 gallons. That includes the whole supply, trade as well as domestic. That would be a fair average of the consumption before we took measures which resulted in reducing that consumption. The trade consumption amounted to 8·87 gallons per head per day; that would leave for the domestic consumption 22·13 gallons. In the year 1865 we began to take measures to inspect the defective fittings, and to ensure a better provision of fittings in the town. We found that if the consumption went on at the same rate at which it was going on then, we should have had to increase our engine power and the capacity of our mains. After we had taken those measures, the gross consumption in the first half of the year 1866 was 19·1 gallons, as opposed to 31 gallons in 1865. The trade consumption was less in the first half of the year 1866 than it was in the corresponding half of the year 1865; it was 7·83 gallons, as contrasted with 8·87 gallons in 1865. That left for domestic use 11·27 gallons. In stating that result as 11·27 gallons, I take the full capacity of the pumps. I think to ascertain the actual quantity of water consumed in the town you ought to allow a certain per centage, perhaps 10 per cent., for leakages in the pumps; that would reduce the consumption for domestic purposes to 10·15 gallons. "Domestic purposes" includes the supplies to houses generally, for water-closets, baths, and so on; and all general trades, such as grocers, drapers, and druggists, those are what are called dry trades: we do not include brewers. I might mention, in connexion with the domestic supply, that in Cambridge we allow water to be used free of charge for gardens and lawns, and there are a great many houses in Cambridge which have gardens and lawns attached to them; that is included in domestic purposes. I may mention that there are several houses where there are a great many taps in the garden, and the water is supplied by the force of the pressure to a great distance. I know an instance where a gentleman has seven taps in his garden for watering lawns. The breweries we supply by meter, and that is included in the trade consumption. The reduction in the consumption is due almost entirely to the repair of defective fittings. I will give an instance with reference to the waste occasioned by the ball-cock of a water-closet cistern. Upon examination the ball-tap of a water-closet cistern attached to a private house was found to be out of order, and wasting the water down the waste-pipe at the rate of about 10,000 gallons per day. The waste-pipe was improperly connected; it was connected with the drain, so that the waste could not be perceived. As soon as it was discovered we took steps to repair it. The only thing that was needed was to change the ball-cock to stop the waste, and as the waste-pipe was improperly annexed with the drain, it was also necessary to alter the waste-pipe in accordance with the company's rule. The cost of that to the company would be 6s.; 10s. was charged, showing a profit to the company of 4s. Supposing a new ball-cock only to have been needed to prevent the waste, it would have involved a cost of 4s.; there would have been a charge of 8s., and a profit to the company of 4s. In many cases the waste of water has been stopped by putting an india-rubber valve on to the ball-cock, at the cost of a shilling; in a great many cases the waste of water was stopped at the charge of a shilling. Investigating these cases involved a good deal of visiting and inspection. We did not experience the least difficulty, nor was any dissatisfaction expressed on the part of the consumers of water. The necessary charges for the alterations and repairs were paid easily, and without grumbling; there is not one owing now—they have all been paid. That change took place before 1866. From that time to the present we have had no further inspection, and our consumption is now slightly less than it was. I had a return made up to last Friday week, and had all the meters taken to ascertain the consumption. I find that this half year it will be less than in the return I have given to you. The company execute fitting work, but we leave it open to the town plumbers. In the case of all the cocks that we put on we keep in repair the washers or valves without charge. We have not found any cases in which repairs to either cocks or taps have been required since the time we have been in charge. The cost to the company has been nothing in the four years for which I have been manager. We very seldom use pipe of more than ½-inch diameter, the weight of the lead being 5 lbs. to the yard. The company make the provision of the fittings a source of profit to themselves. They make a gross profit of about 35 per cent. upon the total amount of the fitting accounts. We have only one or two cases in Cambridge where cisterns are used for domestic supply; that is where there have been new houses built, and where the architect has been a London architect. We do not advise them, but we do not prohibit them. The public may do as they like, but we discountenance them for domestic purposes, because the water drawn fresh from the mains is superior and better for domestic uses than it possibly can be from a cistern. I have examined cisterns connected with water-closets, and have found great impurities in them. We recommend the waste preventers that have been mentioned, but we do not require them. The great majority of our cisterns are water-closet cisterns, with the ordinary apparatus; the others have been used in Cambridge, and they have worked very well, in small houses principally. We insist that the overflow, instead of being carried into a drain, should be turned into some position where an escape of water will be noticed. We do not allow stop-cocks without special permission. The stop-cock is placed generally just inside the house, on the communication-pipe from the main. If they were placed in another place the water might be used for another purpose. They are not often used in small houses. In attaching the services we use the full-bore ferrules—that is, just ½-inch diameter. That supplies a pipe of just ½-inch diameter. There is no restriction in that respect whatever. I believe when the company was first established they did use a few small-bore ferrules, but they found that they did not answer. We have not found it necessary to place any restriction upon the number or position of the taps used for domestic purposes; it is simply a matter for the convenience of the consumers, and the expense they like to go to. We do not alter our charge in any way with regard to any variation in the height of supply required. We can supply water to the top of the highest house in the town, and the charge is the same. We do not require separate service-pipes for each house. We find the profit the company make sufficient to pay for all collections, inspection, turncocks work, and main and service repairs. The town working expenses are more than covered by the profits we make upon the fittings.

Mr. WILKINSON: Can you give the committee a little information with reference to the mode in which you deal with the prevention of fires. Have you fire-cocks fixed upon the main-pipes?

Witness: We have, at the interval of every 100 yards. We have up to the present time used those fire-cocks also for watering the streets; we are just now altering the arrangements, and supplying through meters for that purpose. Engines have not been used in Cambridge for a number of years; they are not required there. The pressure has always been used in case of fire, and it has been found sufficient without the use of engines. The inhabitants of Cambridge have a strong feeling of the benefit of the company's constant pressure in case of fire; and it is a remarkable fact that, owing to the constant supply given by the company, never since that supply has been established in Cambridge has there been a fire of any extent, and before that time fires of considerable magnitude occurred; the fire has been put out before it got to any extent. The fire-cock we use at Cambridge is a sluice-cock, with a bend in a couple of boxes. It costs about £4; but a ball-hydrant, such as Mr. Bateman described, would cost, including fixing, opening the street, paving, making the connexion, and so on—everything except the contractor's profit—30s. to 35s. In large houses, where supply-pipes go up-stairs to the water-closet cisterns, at the entrance of the communication-pipe into the house we place a stop-cock. Generally this enters into the underground or basement kitchen, and the tap which they use for ordinary purposes in the kitchen is lower than the whole of the communication-pipes up-stairs. In the winter time I have recommended that this stop-tap, as it enters the house, should be closed; and at night, when the ordinary requirements for water have ceased, the draw-off tap should be opened, so allowing all the water in the communication-pipes in the house to be drained—that prevents their freezing. In some cases, where they had no stop-taps, I recommended that the supply should be kept on at a very small stream, just sufficient to keep up a constant stream; and I have found, during this last winter, that that has had the effect of greatly decreasing the number of burst pipes. It has increased the consumption to some extent during that time—about 10 per cent.—but nothing in comparison with the advantage given in respect of saving the pipes. I have not the least doubt that the introduction of a scheme somewhat similar in principle to ours in London would be a great advantage, especially in the poorer houses. If the supply of London keeps on increasing as it is now doing, an intermittent supply would cost more than a constant supply introduced under good regulations. I should not consider cisterns necessary. I should leave them to the option of the consumer, except for the water-closet, where I should decidedly have a small cistern. After the new system was fairly introduced, I do not think that more inspection would be required than is now required under the intermittent system. With regard to the stealing of fittings, you might have amongst the poorer classes of houses an iron stand, with an iron pipe with brass working parts, which it would not be worth their while to steal. In the constant supply, the pipe would be always charged; and, therefore, to a certain extent there would be the protection of the water in the pipe. The cost of introducing the new system would be simply a question of seeing that the fittings were in proper order. In the case of a large new house in Cambridge, the cost of introducing the water-fittings, including the ball-cocks to the cisterns (because, as a rule, all houses to which we lay on water have not been supplied with ball-cocks) would be, say with three water-closets, I should think, £7 or £8. The cost in the case of a smaller house not exceeding £10 a year would be perhaps 10s or 15s.; but sometimes a tap supplies a number of houses. I have known instances where the cost has been only about 1s. 6d. per house.

Cross examined by Mr. DENISON: That 10s. or 15s. includes the whole of the communication-pipe of about 20 feet, and a tap; there would be no cistern to small houses. We supply at Cambridge about 3800 houses; that includes premises of all descriptions, trade premises as well as domestic. In ascertaining the quantity of water per head, the trade consumption is deducted. We reckon five inhabitants to each house, which makes the population we supply nearly 18,000. The population of Cambridge Town and the University in the district we supply is about 30,000. We supply a little out of the town of Cambridge proper, so that we supply a little more than half what we may call the town. Cambridge is very well supplied naturally with water. By pumps, the water can be got within a few feet of the surface by boring, and there is Hobson's stream running down two streets of the town, and a few inhabitants get their water from that. The company's water is taken for convenience in many cases. We get our water from a spring three miles from Cambridge, at Cherry Hinton.

Mr. DENISON: You say you require people to have their waste-pipes to their cisterns, so that the waste itself is visible. You have power in your Act of Parliament, I suppose, to do that?

Witness: We have power to see that they have proper fittings, and that is one of our conditions. We have this power by the General Water-Works Acts of 1847 and 1863.

Mr. DENISON: You have to send notices sometimes to people about their waste-pipes, have you not?

Witness: That was at the time they were found out during the inspection. We have only inspected once since we began.

Mr. DENISON: Did you not state that you inspect once a year?

Witness: I think not. We went round to all the supplies during the twelvemonth.

Mr. DENISON: Did you not say, in a pamphlet you published against Mr. Quick, that "those cases which did not come to the office are dealt with by the companies officials keeping their eyes and ears open when on duty, and discovering all they possibly can in the shape of leakage on customers who should be supplied by meter; besides which, the foreman goes systematically to the water-closets and larger consumers (when his other work permits), and sees them about once in twelve months"?

Witness: At that time we were making the inspection, and I thought it might be necessary to do it once in twelve months; but finding that the consumption has decreased since the inspection was made, I have not carried out my intention. I have no intention at present of carrying it on every year.

Mr. DENISON: You sent this circular, I see. "I am requested by the directors of this company to inform you that your water-closet cistern has a waste-pipe attached to it contrary to the regulations of the company. The directors having found that a great quantity of water is being regularly wasted through overflow-pipes attached to water-closet cisterns, and that in the way they are at present fixed the leakage cannot be perceived, they have decided that if waste-pipes are to be allowed they must be carried to some position where the escape of water will be noticed." When were these things issued?

Witness: That was during the inspection. There might have been one or two cases that had not been attended to, in which it was sent in 1866, but the majority had been in 1865

Mr. DENISON: You make 35 per cent. profit upon the fittings, I understand; how do you reconcile that with the statement to your customers, that you are prepared to make those alterations at cost price?

Witness: I think you will find, if you refer to the case I gave, that the cost of making the alteration in the waste-pipe was 2s., and the charge was 2s. We do make those alterations at cost price, but repairs of fittings we do not execute at cost price. In some cases we get 50 per cent., but the actual profit upon fixing ball-cocks varies. Sometimes it is a great deal of trouble, and sometimes it is not; and we have a charge to cover it. We have very few iron pipes in use. I should not recommend them for service in general, the water lying in them. They would not rust if they were painted outside, nor inside unless the air is brought constantly in contact with the wet pipes. The rusting under the intermittent system is greater than under the constant system. There have been a good many wrought-iron pipes put down in Cambridge during the four years I have been there, and they have not rusted very soon. If the taps are to be partly iron and partly brass, the part where the wear and tear would be ought to be of brass. I have not any personal knowledge of any such taps being in use; I know that they are made.

Re-examined by Mr. WILKINSON: Our profit is upon the ball-cocks solely and not upon the waste-pipes. We have an inducement to take care that the ball-taps, and the waste-pipes especially, are kept in proper order, so that there may be no more waste than can be avoided; and that is an inducement to execute the work in a proper manner, without a view to profit. We have had no complaints made of the gross charge which we have made in comparison with the charges made by other tradesmen. We work as cheaply as any plumbers in the town, and cheaper than some. I do not see why the London companies should not make a profit.

By the CHAIRMAN: The system of supply to the £10 houses in Cambridge is simply the tap. The colleges are supplied by us by special contract. The arrangement for the small cottages and for some of the water-closets is a double valve about 15 inches in length and one foot wide. It has this advantage, that it requires no extra strengthening of the structure to put it into the water-closets; it is not very weighty, and we fix these waste-preventing arrangements complete, including the communication-pipe, for 30s. The flush from them is practically ample for keeping the water-closets clean; it is from about two to three gallons each time.

By Mr. BAILLIE: We had a constant supply at Cambridge from the pipes from the first—14 years ago, when the works were established. Before that, Cambridge was supplied with water from surface and bore wells, and we got a little water in some parts from surface water.

Captain *E. M. Shaw*, examined by Mr. CRIPPS.

I am the chief officer of the Metropolitan Fire Brigade. In 1866 I made a report upon the water supply of London as regards fires, in which I said: "I hold a very strong opinion that no advantage at all commensurate with the expense would be likely to arise for any attempt that could be made to improve the present fire-plugs, which are perhaps the worst to be found in any city in the world, and I would urge on the board the advisability of using their influence to obtain as soon as possible a complete system of constant supply throughout the metropolis, coupled with some such ready means of applying the hydraulic pressure to the suppression of fires as that above suggested. Any modification of the existing intermittent system must be attended with loss and inconvenience, and prove unsatisfactory in the end." That is my opinion now. I am quite sure that the present fire-plugs must be condemned before a constant pressure can be brought into London. In another report made in 1866, I said: "The course which I should recommend for obviating this inconvenience would be to discontinue the existing intermittent service, which is complicated and imperfect, and requires special men to work it, and to substitute for it a constant service, with a sufficient number of hydrants which could be opened by any one, and would immediately deliver water without the delay of proceeding to a distance to open one sluice-cock and shut a number of others, in order that the whole of the available supply might flow to the required locality. I am convinced that the establishment of a constant high-pressure service will be found the only mode of overcoming the difficulties, and that any attempt to improve the present arrangements will only tend to prolong the existence of a system which, so far as fires are concerned, is most imperfect and unsatisfactory." That is the opinion that I have formed.

The CHAIRMAN: You had better clear up this a little, and amplify it, because there are so many things mixed up in it. There is first a constant service; then what is the necessity for a sufficient number of hydrants? I want you to explain all those proposals which are mixed up in this. You think a constant service is desirable?

Witness: I think constant service is desirable for fires.

Mr. CRIPPS: I want to know whether the other recommendations which you also suggest are dependent upon that first, because principal improvement; namely, having a constant service?

Witness: I think that so long as the service is intermittent in the side streets, it would be hardly worth while to go, in those streets, to the expense of putting up hydrants.

The CHAIRMAN: Will you explain what is the necessity for putting up the hydrants at all, if by hydrants we are to understand a stand-pipe at the side of the streets? Is that the hydrant that you have referred to?

Witness: That is the hydrant that I should recommend. It is necessary that we should have hydrants in order that there should be the means available for unskilled persons to obtain access to the water on occasions of emergency. At the present moment, according to my view of the question, nobody can obtain water in the side streets of London unless he is acquainted with the special service of that company in that particular part of London. If you have a constant supply that knowledge is not necessary.

The CHAIRMAN: You want a hydrant with a regulating valve in it?

Witness: That is what I understand a hydrant to be. It is not usual to call that which leads the water up to the level of the street a hydrant, unless it is fitted with some means of commanding the water. It is usually called a "goose-neck" if there is no command lock or valve. I think that there should be over every plug or means of access to the water a proper hydrant, with a stand-cock to it, and if it were entirely left to me I should propose to have a fixed stand-pipe in the streets; but I should rather have anything than the present piece of wood, which is merely stuck into the socket of the pipe, and is the most barbarous contrivance I ever heard of. I think a great many other intermediate systems might be suggested short of what I suggest, and yet a very great improvement upon the present system.

Cross-examined by Mr. DENISON: The fire brigade is constituted by an Act passed in 1865, and in that Act the Metropolitan Board are made the authorities for everything. I am aware that the Act contains the following clause:—"All the powers being exercised by any local body or officer within the metropolis as respects fire-plugs shall henceforth be exercised by the board, and the board shall be entitled to receive copies or extracts of all plans kept by any water company under the provision of the Act of the session of the 15th and 16th years of Her Majesty;" that is 1852; "and every such water company shall provide, at the expense of such board, in any mains or pipes within the metropolis, plugs for the supply of water in case of fire, at such places, of such dimensions, and in such form as the board may require; and the fire brigade shall be at liberty to make such use thereof as they may deem necessary for the purpose of extinguishing any fire; and every such company shall deposit keys of all their fire plugs at such places as may be appointed by the board; and the board may put up on any house or building a public notice in some conspicuous place in each street in which a fire-plug is situated." I do not think that they have had time to consider the question of altering the fire-plugs; they have only had charge of this matter for about a year; but I was asked who is responsible for the present fire plugs, and I said they were laid down many years ago. I am not aware that any application has been made to the water companies to allow any fresh plugs to be used. I should be very glad to find that under the Act of 1847 they are bound to keep all the pipes full as a provision in case of fire. I do not believe that they are bound to keep them charged at all times under pressure. They keep the mains full of water, perhaps, but not under pressure. The pressure is varied by shutting off the cock. That can be turned on by the turncock, and the turncocks, as I have sometimes complained, are not always ready. The delay has varied from five minutes to three hours, and in some cases there has been no attendance at all. It has been often suggested that a messenger should be kept at each fire station, whose duty it should be to call the turncock, but that has never been done. The duty is certainly ignored by the fire brigade, inasmuch as it is no part of their business, and they have always declined to undertake any responsibility with the matter whatever. I have never made arrangements with the water companies in the matter. By having a constant supply we should be better off in this way. At present, when the turncock turns on the water, it has got to fill every cistern on every level throughout the whole service before the maximum quantity is delivered at the point where we require it. In many cases the supply of water to the fire-engines is decidedly insufficient, and, I think, has always been so. My statement, when I was examined by a committee in 1862, that, "generally speaking, the supply is efficient all over London for any purposes for which we can ever require it," is as right now as it was then, but in great emergencies it is very difficult indeed to get enough within an available distance; that is at the commencement. When the cisterns all round are charged, we usually get an abundant supply. In my evidence in 1862 I said, "Since I have been in London I have experienced a want of water—twice, I think, in about 600 fires." I prefer Mr. Bateman's plan of hydrants very much to anything that exists in London at present, but I prefer the one of which there is a picture in my pamphlet. I cannot say what is the difference in the cost. Mr. Bateman's, I should say, would be very much cheaper than mine. But there is an obvious reason for that. Mine is adapted to all circumstances, whereas Mr. Bateman's is adapted for a high-pressure service alone. I do not think I could give the exact cost of my own, but I should suppose about £7.

By the CHAIRMAN: I have not made any inquiries as to what any one would undertake for the Metropolitan Board to find and lay down this apparatus; but I have consulted with persons acquainted with such matters, and I have reason to believe that they would be in large quantities about £7 each. That would include the cost of opening the streets and putting them in.

By Mr. KEKEWICH: I have never known of any great delay taking place in fixing the hose to a main in case of fire; but there is very great doubt in London as to the advantage of fixing it on when we get to a fire. In the case of fire, the usual plan is to send one messenger for the engine and another for the turncock. When we arrive with our engines we expect to find the turncock there, and the water turned on ready for use.

By Colonel HOGG: The hydrants I recommended would be so far of use, even without a constant supply of water, that they would be much more available than the present fire plugs with any supply of water; but, in my report to the board, I merely told them that I thought it would be a waste of money to adapt anything to the present system of pipes, which are adapted simply to a low-pressure service. I think there is no question that fires would be more speedily extinguished if our hydrants were established than by the present system, and, consequently, there would be a great saving in fire insurance. I think the pressure ought to be about 300 feet; that is the maximum I should ask for. That pressure is not absolutely necessary if the pipes were laid down entirely anew and sufficiently large; but, as the quantity of water that comes out of any given pipe depends upon the pressure under which that pipe is, it is of great importance that, so long as there are small streets, and small pipes running through them, and large warehouses in those small streets, there should be such a head as is equal to delivering a sufficient quantity of water to meet any exigencies that may arise. That is my reason for putting the figure so very high as 300 feet. I put it higher in order to meet that contingency which, I believe, is found in every large mercantile town in the world, where valuable warehouses are built in close proximity to the dwellings of the poorest people; where there are very small water-pipes for the ordinary house supply, but where there is a great need of a large supply at certain times.

By Mr. BENYON: It is quite possible that, with a hydrant in the street, hose-reels might be used to a large extent. Keys have been given to us by the water companies, for the purpose of turning the water on into the service by the sluice-cocks; but it is almost impossible for any one, except a skilled turncock, with his daily orders from his own company, to know where to go to turn the water on and off. In point of fact, it is skilled labour which the turncocks do; and, if the Metropolitan Board ever take over the duty on behalf of the fire brigade, and take it away from the water companies altogether, they will have to employ an enormous staff of skilled persons to do the duty which, as far as we know, devolves entirely upon the water companies. It is a very large question of expense.

Lord F. CAVENDISH: I think you said, in your evidence in 1862, that there had been only two cases out of 600 in which the supply of water was

deficient. Does your subsequent experience enable you to state that that is about the proportion?

Witness: There would be a larger proportion since that time. I cannot say off-hand what proportion; 10 per cent., perhaps.

The CHAIRMAN: You say there is a difficulty, for the want of regulating apparatus. You cannot screw the hose on to the plug at the place where the plug is.

Witness: Precisely. There is no screw on it; it is merely a socket in the pipe. We cannot put the stand-pipe into it unless the pressure is relieved, so that we can put in the stand-pipe and afterwards turn on the pressure again. Therefore I consider it necessary to connect the common street-plugs into some sort of hydrants, so that you can keep down the water until you have screwed on the hose or stand-pipe. The next difficulty is, that when the water is turned into the district mains, it runs away, through a great number of orifices, into all the houses supplied by that district main, until they are all charged with water. Therefore, at the commencement, you would not get any head or pressure of water if you did connect the hose with the plug. Wherever the service is intermittent that is the case.

The CHAIRMAN: Do you know from experience how long it takes, after turning the water on at the sluice-cock, before you get anything like a head of water at the fire-plug?

Witness: There is no regular time for that; it altogether depends upon the length of the service and the number of houses to be supplied, and also the hour at which we turn it on. With a very short and small service, not supplying more than 50 houses on a low level, if the water supply has been turned off from those houses only one hour, in all probability we should get an abundant supply almost from the beginning—in two or three minutes. On the contrary, with a very large service—say a mile or two long—and supplying a large number of warehouses, and the water supply turned off for 6, 8, or, perhaps, 12 hours, we should be a long time indeed before we should get a full and complete supply out of the pipes—before we get the quantity of pressure due to their size and the head under which they are.

The CHAIRMAN: Have you in London made any experiments as to the pressure being sufficient to throw the water direct from the mains?

Witness: Frequently. Where the services are full, the pressure is very fair.

The CHAIRMAN: But have you found that you could throw water from the hose, provided the pipes are full, without the intervention of the engine?

Witness: In a great many cases. After the first hour of the fire, we generally put in stand-pipes and use them.

The CHAIRMAN: You stated that you would like to have a head of 300 feet pressure; is that the result of any actual experiments as to the height or head of water that is necessary to throw a jet to any given height?

Witness: It is not so much throwing a jet to any given height as to the necessity for getting a sufficient quantity from a small-sized pipe.

The CHAIRMAN: Do you consider, generally speaking, that the head of water in the London service is sufficient to throw the water to the required height—that it is sufficient as regards the quantity of water discharged?

Witness: I think the head of water is generally sufficient in London. It might be made, with proper hydrants, a good deal more available than it is at present; but I hardly think it is sufficient for all purposes. Our main object in having a higher head of water is to increase the quantity by increasing the velocity with which it can go through the pipes; but a tendency has arisen in London to building enormous and valuable warehouses in close proximity to very small houses, which require a very little water indeed. I believe the pipes that have been laid down are not capable of bearing the pressure which would be upon them if the head of water were raised to 300 feet.

The CHAIRMAN: Then it would be a question of taking up all the pipes in London for somebody who chooses to build a warehouse in an inconvenient situation. Do you not think it would be better to leave the persons to the consequences of their folly, rather than put people to the expense of pulling up and relaying all the pipes in London?

Witness: On the contrary, I believe that London is of so great importance that there is no reason why it should be second to any other town in the kingdom. We know that of recent years other towns have supplied themselves with high-service constant supplies. I have not taken the expense into consideration at all; that is not my duty. I take it simply from a fire point of view.

Witness (at the request of Mr. CRIPPS) explained Mr. Bateman's hydrant.

The CHAIRMAN: If that hydrant is used, your expensive process of £7 for every hydrant is wholly unnecessary?

Witness: I do not go so far as all that. I think that my plan is a great deal the better plan, for this reason, that mine acts upon both systems, whereas Mr. Bateman's is only fitted for a constant supply system: it is a very beautiful and cheap hydrant.

Mr. WILKINSON stated, with reference to the information which the committee desired from the Metropolitan Board upon the subject of water-closets, that it would be necessary to communicate with all the parishes by circular, which would probably occupy about three weeks, but that as soon as the information was obtained it should be supplied to the committee.

TWELFTH DAY—THURSDAY, JUNE 6.

Edward Easton, Esq., examined by Mr. CRIPPS.

I am an engineer, and partner in the firm of Easton, Amos, and Son, and during the last 15 years have had considerable experience in the construction and in the maintenance of water-works. I have paid particular attention to the question of providing water on constant service, and the means which could be adopted for introducing that, and from the change from the intermittent to the constant system. I acted in conjunction with my father as engineer to the Brighton Company. I have had the chief management of anything that has been done in the last ten years with regard to those works. The Brighton Act for constant service was passed in 1852. Another Act to enable the company to purchase the existing works was passed in 1854. Under those Acts the company began to supply constant water to the houses which had been fitted for the intermittent system. They found the waste so great that they then applied for a third Act to give them more stringent clauses. Three of the clauses are nearly the same as the protective clauses in the Metropolis Act. The 4th clause gives power to impose a penalty of £5 upon every person who should wilfully suffer water to run to waste. The 5th clause is with regard to powers as to repairs, and to enforce the same to be done. It is simply as damages. Then there are two other clauses to provide specially against washing the fronts of houses, which is generally done at Brighton. After that Act there were arrangements made for laying down there a duplicate system—for laying down mains for the constant service without removing those that supplied the intermittent system. If we had attempted to turn on the water immediately from the intermittent to the constant system, the apparatus we had purchased from the old water company would not have been sufficient to have supplied the water required. My father then recommended the company to lay down a duplicate system of mains all over Brighton, which was done in order that we might be able to give to anybody applying for it a constant service, and at the present moment there is a second pipe in every street in Brighton, so that we are absolutely giving in very many of the streets both constant and intermittent service. The owners or occupiers have an opportunity to take their water from either the one or the other. The arrangements in each house are—first of all, as regards service-pipes: they are to be made of a strong lead pipe, a ½-in. pipe, not less than 28 lbs. to the 15 foot length, or in round numbers a little less than 2 lbs. to the foot or 6 lbs. to the yard, and if ⅝-in. pipes are used, which is not very often the case, they are 33 lbs. to the 15 foot length; ¾-in. pipe, 39 lbs. to the 15 foot length; and 1-in. pipe, 62 lbs. to the 15 foot length. Then all pipes within the premises must be so exposed as to allow of immediate inspection, as no pipes will be allowed to be placed under the floor or buried, except where necessary for the prevention of frost. All connexions must be made with stout plumber's joints. A strong high-pressure stop-tap to be fixed on the service-pipe where it enters the premises, and all taps supplied from the company's main must be high pressure. All cisterns to be supplied with high-pressure ball-tap; a waste or warning-pipe must be placed two inches below any air-pipe to closet, and be so fixed that the overflow, if any, may be seen; no waste-pipe will be allowed to lead to a closet, drain, rain-water pipe, or any place that prevents the immediate discovery of the waste. All closets (Coumin's high pressure excepted—that is a particular form of closet of which I have brought a specimen here to show to the committee, and is in frequent use in Brighton) must be supplied from cisterns with self-closing valve. Then there is a restriction about gutta-percha hose. We do not make any distinction as to the self-closing valve, but we recommend Coumin's closet, which is the water-waste preventer. All boilers or hot water apparatus must be supplied from cisterns, as in no case will they be permitted to be fed direct from the company's mains. As to laying on water, all the pipes, taps, cisterns, closets, and other apparatus must be approved of by the inspector, and complete before the connexion is made to the company's main; and it is requested that persons intending to have the water laid on should previously call at the inspector's office, where all requisite information will be given them. These are the regulations which are set forth by the company; but I have had considerable difficulty in persuading our directors to take the means which, in my opinion, are necessary, and in accordance with these regulations. I have had experiments made showing the use of water in those cases where the system has been properly carried out, and other experiments, showing where it has been partly carried out. In the first place, there is a stop-cock always put between the main and the house on the communication-pipe at the most convenient point, sometimes outside and sometimes inside the house; a lead pipe of the specified weight is then attached, and in the case of the poorer houses a big cock is fixed either over a sink or not, as the case may be. They are done in both ways, and in the case of a closet being put on, one of these self-acting closets, or Coumin's closet apparatus is attached to the closet in the poor houses. The tap is generally in the house when the house itself is supplied, but in very many instances that is not the case. We have a very poor population in some parts of Brighton, and in those cases the courts are supplied by a tap standing out in the open court. There are very many cases, with quite poor houses of £5 or £6 rateable value, which are supplied with taps in the houses also. Generally speaking a house of the lower class has a closet of some sort, or a privy, but frequently, in the small, poor courts, there are but one or two closets common to them all. I find what is liked best in Brighton, amongst the poor houses, is Coumin's closet, or rather a pan with a common syphon tap, flushed by hand with a pail. I have a table showing how many people have come on to the constant service, or rather how many services we have. For the last five years I have taken it out, because we have begun to put them on more frequently during the last five years. In 1862 we had a total number of 13,433 services, and at that time we had 722 only on the constant and 12,761 on the intermittent. They gradually increased—of course, on the constant—and in 1866 we had 2032 on the constant, and 13,091 on the intermittent. I have also added the average daily supply that we have pumped. We pumped 1,200,000 gallons per day in the year 1862, including Sundays; and in 1866 we pumped 1,488,000 gallons. The total number of gallons per day for each service or house was in 1862, 89 gallons, and in 1866, 98 gallons. I think probably that our supervision is now getting rather too little for the number of houses, and if we put on another inspector we shall reduce that again to the 89 gallons, or something like that. We have only one inspector now. The result of investigation shows the majority of houses which are rated under £20 a year have been laid on with the constant service. We have had many new houses of the class built in those five years. I think the chief of those that have been put on the constant service have been new houses. The new houses generally have the constant service, because the fittings are cheaper. When any one applies to have his house put on the constant system, we are obliged to tell him that he must change his service-pipe from the intermittent pipe to the constant pipe. That puts a man to a very considerable expense, and consequently we get fewer applications than we should if they were new houses. I have ascertained the consumption per head per house under both systems. In Washington Street, in which there are 90 houses at £11 a year rating on the constant service, used 16,000 gallons a week. The quantity per house was 25·38 gallons, the average number of persons in each house was seven, and the quantity of water consumed was 3·62 gallons per head per diem. Those houses have been newly fitted up; they have a ½-inch screwed down tap over a sink, and they have water-closets flushed by hand, by pail—that is on the constant service. There is no cistern to the water-closets in those houses; they draw the water whenever they like, and as much as they like. Each house has a tap over a sink. The 3·62 gallons includes everything, not only the water used, but the water wasted in every shape, from the time it leaves our mains until it gets into the drains, or wherever it goes. The next instance is on the intermittent system—a street containing 124 houses from £8 to £10 rating. We tried it for five days on the intermittent service, and for five on the constant service. This is a street that is generally on the intermittent service; they have there chiefly privies, no water-closets at all. There are about 12 of those out of the 124 houses with Coumin's closets attached, and the rest of the houses are flushed by the pail in the way I have described. They used 4·64 gallons per head; on the constant system they consumed 6·19 gallons. Then I have an instance of a better class of houses, rated at from £60 to £100 a year. We tried those for three days. Twelve of them are occupied. They used 166·66 gallons per house, and 18½ gallons in round numbers per head per day. Those houses have each three water-closets. We have no power for charging extra, so they have as many as they like. I tried another row of 52 houses on the intermittent service—about £30. They consumed 21·7

gallons per head. They have one good water-closet, fitted up with a self-closing valve, and one old-fashioned hopper water-closet, with a common turn-tap—simply a stop-cock—which is very wasteful. We tried another small street of houses, from £4 to £5—one of the poorest streets in Brighton. It was laid on last year by order of the corporation, under the sanitary Act of 1866, and it has been in operation about a twelvemonth. There are 48 houses. They are 11¼ gallons per head per diem on the constant service; 30 of those houses have the water in each case into the house; 12 of them are fitted with Coumin's closets, and the rest are chiefly flushed by hand. They all have closets, and all have water, but they draw that water at the taps for other purposes. The remaining 12 houses that have not a tap laid on to each, are supplied from one stand-post in the court. There is a court attached to this little street, but the cock, when I measured it myself, was running at the rate of from 180 to 200 gallons a day. I have no doubt there were others in the same street also defective. I think that the chief waste of water, whether on the constant or the intermittent service, per head, is amongst the better class of houses.

The CHAIRMAN: Where is the evidence of waste?

Witness: The evidence that I have as regards that is drawn from houses in London. I have no special means of speaking to the waste as between the better and the poorer class of houses in Brighton. In every case where we can enforce it we endeavour to enforce the rule that the waste-pipe shall not go into a drain or a soil pipe, so that it cannot be seen.

Mr. CRIPPS: Having had that system a good deal under your charge, you can speak generally as to your opinion of the advantages, particularly with regard to the poorer classes of houses, of the constant system over the intermittent.

Witness: I think very strongly that every poor house ought to be supplied upon the constant system, in the interest of the tenant: it is imperatively necessary, I think. The intermittent system at Brighton is not what the London intermittent system is. We turn it on for four hours daily at each house, and the people are, I believe, during the remaining 20 hours, very badly off for water. No doubt they let the tap run; when it is turned on they never think of turning it off; they take pails out and catch what they can. That, no doubt, wastes a great deal of water. I believe in such cases that it would be to the interest not only of the consumer, but of the company, with proper regulations, that it should be laid on on the constant system.

Mr. CRIPPS: Do you consider it desirable for the poor, with reference to their comfort, to have the water, after being supplied, kept in storeage of that kind?

Witness: No, certainly not; it is not only my opinion, but the opinion of everybody who knows anything about the poorer class of houses, that a cistern is a great evil; either in London or elsewhere, it is sure to be contaminated. Our inspectors are always going round where you have the constant system. We sometimes have complaints, but very seldom. We generally find that the people do not complain so much of the inspectors going to the house in a place like Brighton, but as soon as a fitting is found out of repair and the gentleman is asked to mend it, than he begins to complain. We had one or two cases last week. One gentleman was very willing that our inspector should go, but when it turned out that the ball-cock was out of order, he was not so pleased that he should have to repair it, and he complained to the board and wrote a letter about it. With the poorer class there is no difficulty, because you can walk in and see the tap in every case. The poor are only too willing that the thing should be investigated.

Mr. CRIPPS: At about what pressure is your service at Brighton?

Witness: We have four different zones at Brighton—four different pressures, varying from 10 feet above the sea up to 470 feet. The average pressure upon each level—the height, rather, of the reservoir above the floor of the house—would be about 150 feet in each case. Our charge is ninepence in the pound on the rateable value for every class of house, poor as well as rich. There are 17 houses at Brighton which are rated only at £1; they only pay us 2¾d. a quarter for water. The annual value of the house would be about 30s. The rent cannot be much more. There are 60 houses rated at £2, and a great number at £4.

Mr. CRIPPS: Have you considered what plan would be the best to adopt in the case of courts, where the landlord owns several houses?

Witness: I think that in London the best plan of all would be to supply the water by meter to the landlord himself, and in this way, not that he should pay so much per 1000 gallons for every gallon that is used, because in that case he would take care that the poor did not get it probably, but that he should pay the same rate he now pays for a minimum quantity, of say 25 gallons per room or 50 gallons per house, in a case where the house is occupied by only one family; and for any excess beyond that quantity that the meter shows he should pay at a certain fixed rate per 1000 gallons. Under any circumstances he should be compelled to pay for a certain quantity, and the company should be compelled to give it, and that I would put at about 25 gallons per room. With regard to the meter, if the landlord chooses to pay for it, let him, of course, put it in; otherwise I should think the company ought to provide it and charge 10 per cent. on the outlay, including the maintenance of it. They can get a meter kept in order by the makers for 5 per cent. per annum, and the other 5 per cent. would pay them for the outlay. Supposing that is found impracticable, I should say that supplying a certain quantity only through a ferrule per day would be a very good way if there were a water waste preventer; so that the poor people can draw 4 or 5 gallons at a time, and they have not to wait whilst it dribbles into the pail, which, of course, is inadmissible. A pailful is a gallon and three-quarters to two gallons.

Mr. CRIPPS: Can you say how many houses could be properly and efficiently inspected by one officer in the course of a year?

Witness: I believe you could efficiently inspect, twice a year, 3000 houses of the better class, and about 5000 or 6000 of the poorer class, and if the company do what, in the country especially, it is clearly my opinion that they should do—namely, undertake the supply and repair of the fittings—the inspectors might do all the small repairs at the same time—that is to say, they might keep all the screw-cocks in order, and put new leathers in, or do any little repairs of that sort at the same time.

Mr. CRIPPS: Assuming that waste could be prevented, have you also formed an opinion about what would be a sufficient ordinary supply per head per day?

Witness: I have; I believe that 15 gallons per head per day through the week would supply any house in London—any house at least of a class up to, say, £150 rental. I think above that, probably where there are two or three baths, a larger supply per head ought to be given, because necessarily in a larger house there is more washing, and everything is more lavish, of course. My reason for thinking that (it is not altogether thinking) is this:—I have had an experiment made in my own house, which is near Russell Square, of a rental of £120 per year, and one at a house where my brother lives, in Montagu Square, and the house of a friend who lives in Euston Square. I took it for a week, and measured the absolute contents of the cisterns, and how much was filled, and the result of that experiment was that at my own house we used every day 80 gallons, or 11 gallons and a little over per head; at my brother's house they used 102 gallons, or 11 gallons per head, counting four children as two adults.

The CHAIRMAN: That is a new mode of computation; you had better count them all, or otherwise we shall have no means of comparison.

Witness: Then if you take the four children as four persons it would be 9 gallons instead of 11 gallons; and at the third house they used 11 gallons per head, but in that case there was a ball-cock out of order, and when the water came in a certain quantity of it was wasted every day. I think the expense of the alteration from the intermittent to the constant system has been overstated, not as to the fact of its being necessary in some instances to renew the communication-pipe, but in taking the 470,000 houses, and saying that the whole will necessarily have to be replaced with a new communication-pipe. Of course, I have no direct evidence to give upon that point. It is impossible for any one to say what pipes there are in the different houses without making an inspection, but I believe it will be found that all the better class of houses—say houses above £80 a year rental, which have been built within the last 20 or 30 years—have been fitted up with pipes very similar in weight to those we prescribe at Brighton. One reason I have for thinking so is, that in the course of our business we make lead pipes, and we supply about 1200 tons a year of lead pipes to people in London and elsewhere, and of those 1200 tons, about 400 tons are the ¾-inch and ½-inch pipes that we are speaking of, for we have supplied them for more than 70 years. My father and his firm have supplied Mr. Thomas Cubitt, for instance; every pipe he has had, I believe, has come from our works, and seven-eighths of that quantity at least that he has had have been of the weight, or nearly of the weight, which is specified in our Brighton regulation. I will tell you exactly. It has been 22 lbs. per 15 feet for the ½-inch pipe, and it has been 32 lbs. or 36 lbs. for the ¾-inch pipe, and for the inch pipe 52 lbs. or 56 lbs. And we have also supplied Messrs. William Cubitt and Co. for some time. The practice of making and selling the cast pipes ceased long before 1830, but I do not know exactly. I should think at the beginning of the century. I am sure that all the pipes have been either drawn or forced for the last 40 years. The forced pipes are certainly the strongest, but I have no means of telling in what degree. I think to a certain extent it stands to reason the lead is more closely compressed in coming out. The press we use in making it is equal to from 800 to 1000 tons. I cannot say what their relative strength is compared with cast pipes. Cast pipes are very rare now. In some of the London houses you would probably find them. I think they would be much stronger than anything we use now. The pipes which our firm have supplied would not require to be altered for the constant service provided the head did not exceed a constant pressure of 150 feet or so. In that case the waste-pipe ought to be altered; the waste-pipe of the cistern ought to be brought out into some conspicuous place, so that it could be easily seen by the inspector. The ball-cocks ought all to be looked to, and if out of repair should be renewed. I think it very probable that in a great majority of cases the ball-cocks would have to be renewed. The cost at which the ball-cocks could be renewed would depend upon the size of them; for the half-inch size, 5s. would pay for it quite well; and for a three-quarter-inch it would be about 7s. The cost of altering the overflow-pipe and bringing it through the wall would, of course, all depend upon where the cistern happened to be. In many houses in London that, I am free to say, would be impossible, for the water-closet is very often in the middle of the house, even in the better class of houses. I hardly know one where it could be managed easily, and in those cases it would involve some expense for altering the waste-pipe; but supposing that you could alter it, as we do at Brighton, we find that something like 4s. or 5s. will alter the waste-pipe very well. In London, the waste-pipes are generally turned back into the water-closets below the traps. Therefore you would have to carry the waste-pipe into the kitchen, and let it flow into the kitchen, to remind the servants that something was wrong, and that is the only way I can see in which it could be done. In the good London houses generally the ladies closet is upstairs, and you could not manage in that case to get the waste-pipe outside, which would involve the expense of carrying the pipe down through the whole house. A lighter pipe might be used, at 3d. per foot, but it would cost nearly £1 more. I would certainly advise that the cistern should be retained in the better class of houses. A cistern necessarily breaks the pressure of the water; it takes off the pressure from the draw-off taps, which would be very inconvenient upon the constant service principle, especially where the pressure is great, and therefore the cisterns are useful in that respect. It is always urged against the intermittent system with cisterns, that the water for drinking does not come fresh and pure from the mains. I see no objection to there being a pipe direct from the main purposely for that, with a proper screw-tap; but in that case I would put no waste-pipe under it at all—I would let it run on the floor.

Mr. CRIPPS: Have you considered at all how the constant supply affects the supply of water in cases of fire?

Witness: Yes; I can give you the results of our practice in Brighton, which I think is about as well supplied a town in case of fire as any in the kingdom. All the mains and service-pipes are constantly charged of course, because we are obliged to give constant service into the houses. Every fire-cock is provided with a screw, to which the hose can be attached, and the hose-pipes are kept at the police-stations. The turncocks have nothing to do with it, and we do not know or care when a fire takes place. A policeman goes to the hydrant and sees to it. The natural place to go to when a fire is discovered is the police-station. They have there a large reel with the hose rolled upon it; they wheel it away to the place where the fire is, and with a key which they have with them screw it on in two minutes, and there is a pressure which will send the water over any house in Brighton. They have no fire-engines in Brighton. We have a very efficient police, and they do the whole work of the fire business. We have nothing to do with it. We object to having the hydrant over the main; it is put just inside the kerb, if we have a right of prescribing it. Any one can see it there.

The CHAIRMAN: Is your hydrant so constructed that you have to introduce an intermediate stand-pipe to screw down the valve, or can you take the hose at once and screw it on to the hydrant?

Witness: In the case of Brighton you can screw it direct on to the hydrants, and then there is another spindle by which you can open the valve. The cost, including the branch to the main, the cutting of the main, and the putting the branch on, is about £3 10s. each. In many cases in London you would require to have much larger ones, because the steam fire-engines use a great deal more water. I think the best would be the common sluice-cock, and a simple branch with a screw to it. You could put that in either 4, or 5, or 6 inches, as the case may be. The diameter of ours is 3 inches. I think I may have under-stated the cost for London—£4 would be about it for the whole, including the relaying of the road and the pavement. The relaying of the road in London is an expensive item. That is independent of the stand-pipe, which would cost as much as £3; it depends upon its length, and the copper holes, and so on.

The CHAIRMAN: Did you give us the expense of merely having a branch, using the sluice-cock to put the water on?

Witness: In the way that I last suggested it would be more expensive. A 3-inch one would cost probably from £5 10s. to £6, and therefore it is only in the larger cases that I would put that. We have some round Buckingham Palace supplied with water from the Serpentine with very large pipes, and there we are able to put on a steam fire-engine, capable of throwing 500 gallons a minute. We have put four or five of them round the palace; and we have got those large ones round the Houses of Parliament. The very cheapest way in which you could go to work to let the water out of the mains in London would be either to attach Bateman's or somebody else's apparatus direct on to the plug which stands up from it. I dare say the whole expense would not exceed 25s. The objection to that is, that in London the traffic is so enormous that the box would not stand any great length of time. I should prefer it being put in the pavement, for this reason: that it is not only out of the way of the carriages, but that you can see it in a moment; whereas in the middle of the street it is liable to be covered up by dirt. Unless you have an indicator, and even then, it is astonishing how difficult it is to find it in the middle of the street. You might get very well from any one of those fire-plugs a jet equal to, say, 60 to 80 gallons a minute. The Metropolitan Board have not consulted me about the fire-plugs.

Cross-examined by Mr. DENISON: I have not made any estimate of what it would cost to do the fire business of London completely, according to my views. My father was asked by Mr. Hankey to give evidence before the Metropolitan Fire Committee. The figure that he gave—£3,000,000—was to include a very great many works. It was to do the fire business of London thoroughly. It would have been a very efficient system. It was mentioned in the report of the committee, and talked of also by Mr. Quick. There was a separate system of reservoirs and fire-mains altogether, so that the full pressure of the reservoir should always be on the mains. It was not exactly what Capt. Shaw wants; he does not go far enough. The plan of my father's would not cost more than Capt. Shaw's; but his would not be so good as my father's, inasmuch as he would not have the reservoirs. At Brighton we have the duplicate mains laid all over the town. I should not think it was necessary in London, if time is given to make the necessary alterations in the fittings. In Brighton the people have to do all these things—putting the fittings in order and keeping them in order. We have the power to do it, if, after three days notice, they do not put them in order. If we do it, we recover the expense from the landlord in poorer houses, and from the occupier, of course, in the others. The Act says we may sue either the owner or the occupier. All our water is pumped at Brighton from wells in the chalk, first of all, into reservoirs; we pump it on the average to 250 or 260 feet high. I think that not more than 200 houses altogether at Brighton have been changed from the intermittent to the constant system in the whole of the five years. From 1863 to 1866 the quantity taken seems gradually to have been creeping up—the figures are 87, 90, 91, 98; and the only way I can account for it is, that the inspection is not so good—it is getting to be more than one inspector can do. Another inspector might reduce it back to what it was before. We are obliged to keep up the inspections very closely, or else they soon get ahead of us; we should be like Glasgow very soon. The meters we used in a great many places were Siemens's; Messrs. Guest and Chrimes supply them; they are new ones. One meter was put to each street. A meter registers all the water that passes from the main, whether it leaks in the service-pipes or wherever it goes. I think there were inch meters which were used for the small streets. There were also 3-inch meters, as well as 2-inch. A 3-inch meter was used at the Park Crescent.

Re-examined by Mr. CRIPPS: The duplicate system we have in Brighton simply arises from the Constant Service Company having purchased the water-works. We should have supplied on the constant service principle if we had gone on with the first Act, and put on new fittings. We were bound to give a constant service immediately at Brighton, and we had no time to do it. We found that the waste was so much when we laid the water on. We laid out £17,000 or £18,000 upon those pipes. The 400 tons of lead pipes which we supply yearly go to several persons. About 46 miles goes to London, and those would not require renewal if there was constant pressure. I think the price paid at Brighton for watering the streets is 5d. per 1000 gallons. We had a great dispute with the town authorities. We thought they used too much water. There was a constant dispute, and at last they said they would take it by meter, and then, after our deputation from the board had gone to a great number of towns, they proposed, first of all, to give us only 3d., I think, and then 4d. We stood out for 6d., and at last got 5d., rather than go to arbitration. We thought it better to lay down a double set of pipes rather than give a constant supply through the pipes which had been laid down for the intermittent supply service. We found it was impossible, with the works in the state in which the old company had left them, for us to supply a proper quantity of water; the engines were not equal to pumping the extra amount which would have been necessary to meet the waste in the intermittent service-pipes. We tried the experiment. We turned the water on one Monday morning, and again on the following Monday morning. The first time we did it on the intermittent system in the usual way, and we found that the water consumed—that is to say, all that went out of the reservoir—was between 90 and 100 gallons per head. On the following Monday, when we did it on the constant system, the quantity consumed was 177 gallons per head, or nearly double. The same pressure was used exactly on both days.

The CHAIRMAN: Then why did you not attempt to examine the state of affairs in the houses, and prepare the people for using the existing pipes for the constant supply?

Witness: Because we found a great objection on the part of the landlords to do anything towards altering the fittings; they were satisfied in the better class of houses with the service upon the intermittent system.

The CHAIRMAN: Then you had got yourself into the dilemma, that if any individual asked for a constant service, he was entitled to have it, although his next-door neighbour declined it, which was an impossibility, and, to get yourselves out of that difficulty, you had to have a double service?

Witness: Precisely.

The CHAIRMAN: You stated that you had several zones to meet the different elevations in Brighton? Were all those zones established before the constant system was introduced?

Witness: No. When we bought the works of the old company we built one reservoir only with a stand-pipe; that is to say, the reservoir supplied a certain proportion of Brighton—about five-sixths—and then there was a stand-pipe over which they forced the water for the supply of the other sixth. In our first Act of Parliament, which enabled us to purchase the old works, we provided for putting immediately two other service-cisterns or reservoirs, one at a height half way between their reservoir and the sea, and the other about 30 or 40 feet above the top of their stand-pipe, so that we made the one large zone and one little zone into three. Since then they have begun to build up by the race-course; the workhouse has gone up to near the grand stand, and to meet that we have now a reservoir 480 feet above the sea. That will make a fourth zone, to command the upper level.

The CHAIRMAN: What expense was incurred in putting up the intermediate reservoir, and introducing the intermediate zone?

Witness: I think the amount expended under that Act of Parliament was £30,000. For that we put up those two reservoirs, and a large engine and a new engine-house; and we also laid a main straight from the engine-house to each of those reservoirs; and we put also delivery-mains from the reservoirs to join the other mains which were there already, and cocks at different points where we desired to cut off the water to make a zone, Brighton being very eligibly situated for that. We constructed a covered brick reservoir containing a million gallons low service, and half a million gallons high service. In size it was about a third of an acre. It was made as large as that in order to save our pumping in the night, and to have a certain storeage, because we did not wish to work the engines day and night, as they do in London. We have a storeage of about 2½ or 3 days supply for Brighton all over.

The CHAIRMAN: Would it have been practicable to adjust the difference of the zones without a large reservoir by a small regulating reservoir?

Witness: Yes; and we could have done it without any reservoir at all. Without any cistern we could have done it in this way: each of our large engines pumps each of the services at the same moment; that is to say, we have one set of pumps running into the low service, a second into the middle, and a third into what used to be the high, and now the fourth into the highest, and they are all worked at the same moment by the engines; therefore, if we had no reservoirs at all and pumped direct into the main we should supply our zones as we do our reservoirs, that would be having a separate pump to each zone, as it is. At Brighton we could do that now; we could shut all our reservoirs, and yet supply the town without any reservoirs at all to-morrow.

The CHAIRMAN: If the company have several pumps in their pumping establishments, they have only to connect each zone with a pump, and so they can regulate the head of water in each zone?

Witness: They could do so, but it would, in the case of London, cause an enormous expense, because you would have to carry your pipes from the pumping station a long way off to the different levels, and have each separate pipe connected with a separate pump going to the particular zone that you wished to put it under.

The CHAIRMAN: Do you think it would be possible to introduce small reservoirs to regulate the different zones upon the London system without there being large reservoirs?

Witness: I think an apparatus might very easily be designed. I think I know of one which, at a very moderate cost, would alter the pressure to anything you liked either in the main or the service-pipe. If I remember rightly, it is done at Manchester.

The CHAIRMAN: After the water has gone through a considerable amount of piping in the town, have you any knowledge of the extent to which the water can be thrown from the plugs or hydrants?

Witness: I can only say generally that we have always found that there is pressure sufficient to throw it on to the top of a house without any additional pressure. We arrange it in this way: each of the zones is immediately capable of being connected with the one above it, and if we found that we had not pressure enough in the higher parts of the zone to throw a jet to the top of the house in the lower zone, we should throw it into the middle; we should connect it, so as to get the pressure of that zone, and also the contents of the reservoir of that zone.

By Mr. BENYON: We do not use our whole steam power every day. We have a duplicate engine at the works, therefore if one of the engines wanted repairing we could repair that engine without interfering with our supply. Of course, if a main requires repair we must shut off the supply, and during that period on the constant system the consumers would be without water; that is one of my reasons for wanting cisterns.

By Lord FREDERICK CAVENDISH: If the London water companies were required to afford a constant service it would not in my opinion be necessary for them to provide a duplicate system of mains. I should propose, certainly, to supply a constant service by meter. I think it could be so designed to be so supplied by meter with perfect fairness to the water companies and to the consumers, by making certain arrangements, and the general principle upon which I would propose that that should be done would be this: That there should be a sliding scale adapted to the class of house; each house should have a certain amount of water allotted to it, just in the same way as I allotted 25 gallons to a room just now. I would take a £100 house and allot perhaps 150 gallons of water per day, and to a £200 house 300 gallons per day, and so on, upwards and downwards, provided no house should have less than 50 gallons. Let the companies charge the same rate as now for that minimum quantity of water, and if more is consumed, or passes through the meter, the consumer should have to pay for that additional quantity. There must be a meter for each house; it involves a separate supply-pipe. I think it would pay the companies very well to provide separate supply-pipes, because it would save the water. In the case of a £100 house, it would be a ⅝ meter, which passes 150 gallons per hour, under a 50-feet head, and you could fix that to any service-pipe for 45s., inside the house, that is to say, that would be the cost of it fixed; the price put down in this list is 54s., but then there is a discount off to the trade, and of course the water companies in such a case as that would get it as cheap as anybody.

The CHAIRMAN: That would be a million of money to be spent in London?

Witness: I dare say it would be £800,000 or £900,000, but it would save an enormous quantity of water.

Lord FREDERICK CAVENDISH: It would save the water companies an enormous sum of money, but it would put the cost of the saving upon the consumer. Would he not complain?

Witness: He would have to pay the 10 per cent. upon the 45s. That is a way in which it could be done by meter; that, however, is only a suggestion.

Lord FREDERICK CAVENDISH: In making the change from the intermittent system to the constant system, would you not have great difficulty to overcome, because the fittings adapted for one system are not adapted for the other?

Witness: Certainly, that it is the great difficulty. I think that could be overcome without applying a separate system of mains, by having a proper number of inspectors. The change would be very difficult indeed at first; it is a matter of miles; a certain time would have to be given, and if it is made compulsory upon the water companies to give, it must be made compulsory upon everybody to take it. That ought to be done by legislation, and then a certain time ought to be given for the alterations of fittings; it ought not to be left to the water companies, but they ought to be compelled by a clause in a general Act of Parliament.

The CHAIRMAN: You presume that the change would be made in sections in London, taking the district mains one after the other?

Witness: Yes, no doubt, as fast as possible.

(To be continued.)

Miscellaneous News.

WESTERN GASLIGHT COMPANY.

The Ordinary General Meeting of the Proprietors of this Company was held at the Offices, No. 28, Argyll Street, on Thursday, Aug. 29—F. W. Russell, Esq., M.P., in the chair.

The Secretary (Mr. Barber) having read the notice convening the meeting, the following report and statements of accounts were presented:—

The shareholders will observe from the annual statement of accounts to the 30th of June last, that the company's business has continued to make satisfactory progress, and that the available profit suffices to maintain the authorized dividend of £10 per cent.

The directors, therefore, recommend that out of the balance now standing to the credit of the profit and loss account, after deducting the dividend at that rate for the first half of the financial year, the following dividend, less income-tax, be declared for the second half year, viz.:—

10s. per	A share	. . . . .	(£10 paid).
5s. „ New	B „	. . . . .	(£5 „).
4s. „	C „	. . . . .	(£4 „).
1s. „	D „	. . . . .	(£1 „).

It may be as well to note here that since the voluntary reduction in price made by the company, the consumers have saved nearly £30,000, to which, under the Metropolis Gas Act, the company was entitled, in order to accumulate its authorized reserved fund.

At the last general meeting, the shareholders were informed that the Board of Trade had given notice of a bill to be introduced in the House of Commons for altering the Metropolis Gas Act of 1860.

The bill, when issued, instead of merely carrying out the report of the select committee of last year, went far beyond it, and was so framed that the basis of remuneration, on the faith of which the shareholders had embarked their capital, in supplying the metropolis with gas, would have been wholly destroyed.

The companies lost no time in making known the true character of this measure, and they had no sooner done so than the proposed violation of the faith of Parliament was generally condemned.

Subsequently an arrangement was entered into between the Government and the companies, by which the former gave up the provisions which were the most objectionable in principle, and the latter, not shrinking from the fullest inquiry into their affairs, and believing that a settlement of the question would be beneficial, withdrew their opposition to the second reading.

No such settlement has, however, been effected. Although the liberal and conciliatory course pursued by the companies had enabled the select committee, to whom the bill was referred, to pass a number of very important clauses in favour of the consumer, they rejected the dividend clause when brought up, and supported in good faith by the Government counsel, and, at the instance of the companies opponents, threw out the bill, after sitting for twenty-three days.

These protracted, costly, and harassing proceedings have, therefore, only resulted in a report by the committee, suggesting that if the companies do not consent to a material alteration of the rights (in respect of profits), which Parliament has so deliberately granted them, the local authorities should have competing powers to supply gas—a course which the committee themselves, however, state would be attended with great inconvenience, and which the select committee of last year, to whom the corporation bill was referred, expresly refused to sanction.

It will be satisfactory to the shareholders to know that the select committee, like that of last year, do not impugn in any way the *bonâ fide* management of the companies, or allege that they have been guilty of any infringement whatever of the Metropolis Gas Act.

General Sir Henry George Andrew Taylor, K.C.B., and Messrs. Francis Edwards and Vandeleur Benjamin Crake, directors, and Mr. Thomas Ford, auditor, retire by rotation, and respectively offer themselves for re-election.

Mr. Thomas Wilde Powell, of the Cherry Orchard, Charlton, has also given notice of his being a condidate for the direction.

Dr. *General Balance-Sheet, for the Year ended June 30, 1867.* *Cr.*

To Proprietors capital, viz.:—				By Permanent investment			£341,568 19 9
20,000 A shares (£10 each)	£200,000	0	0	Sundry debtors			33,237 17 11
10,000 new B's (£5 paid)	50,000	0	0	Stock in trade			11,986 7 2
10,000 C's (£4 paid)	40,000	0	0	Cash in hand			6,934 13 5
20,000 D's (£1 paid)	20,000	0	0				
	£310,000	0	0				
Received on account of £1 call, due 1st prox., on class C shares	2,631	0	0				
New B share loan account	£ 6,960	0	0				
Bonds and debentures	40,500	0	0				
	47,460	0	0				
Sundry creditors	14,587	5	8				
Unclaimed dividends	188	10	0				
Leasehold redemption-fund	124	7	3				
Profit (balance to be appropriated)	18,736	15	4				
	£393,727	18	3				£393,727 18 3

Dr. *Capital Statement, June 30, 1867.* *Cr.*

To Expenditure to June 30, 1866, as per former statements			£356,285 9 5	By Share capital, &c., to June 30, 1866, as per former statements			£325,043 2 7
Expended from July 1, 1866, to June 30, 1867, viz.:—				Call on class C shares, due Jan. 1, 1867			10,000 0 0
Works extension on freehold	£3,457	9	5	Receipts on account of class C call, due 1st prox.			2,631 0 0
Ditto on leasehold	6,269	16	7				£337,674 2 7
Main-pipes	£2,868	19	9	Loans at this date			47,460 0 0
Laying	1,097	8	11				
	4,566	8	8				
Service-pipes	£346	8	6				
Laying	315	14	7				
	662	3	1				
Reinstating roads	388	16	5				
Meters	£983	17	11				
Fixing	111	3	0				
	1,095	0	11				
Lamp-posts and lamps account	93	0	2				
	16,532	15	3				
Balance	12,315	17	11				
	£385,134	2	7				£385,134 2 7

Dr. *Revenue Statement, June 30, 1867.* *Cr.*

To Coal			£52,654 6 4	By Gas			£108,114 4 3
Supervision and labour			11,891 3 9	Meter-rental			2,835 17 7
Water, oil, and sundries			2,369 7 8				£110,950 1 10
Works renewal			6,751 5 4	Coke			£6,478 0 2
Restoring pipes and meters			3,597 17 0	Breeze			2,577 2 5
Lamp lighting			1,664 17 3	Tar			3,896 7 6
Repairing lamps			411 16 0	Gas liquor			118 8 1
Direction and audit			1,370 0 0				13,069 18 2
Salaries			4,075 15 6				
Collector's commission			1,250 2 2				
Rents, rates, and taxes			1,351 6 2				
Stationery and printing			253 12 1				
Parliamentary and incidental expenses			1,873 0 6				
Bad debts			588 8 9				
Leasehold redemption-fund			25 0 0				
Profit of year to June 30, 1867, carried to profit and loss account			33,892 1 6				
			£124,020 0 0				£124,020 0 0

Dr. *Profit and Loss Statement, June 30, 1867.* *Cr.*

To Interest on loans			£ 2,416 19 7	By Balance from June 30, 1866			£17,261 13 5
First half year's dividend, declared February last			15,000 0 0	Less dividend declared August, 1866			15,000 0 0
Balance to be appropriated			18,736 15 4				£2,261 13 5
				Revenue account (profit of year, to June 30, 1867)			33,892 1 6
			£36,153 14 11				£36,153 14 11

The Chairman, in moving the adoption of the report, said it required little elucidation. He congratulated the shareholders upon the successful results of the operations of the company. The gas supplied by them had been of a first-rate quality, and the works of the company had been maintained in a high state of efficiency, while the bad debts incurred amounted only to something less than one-half per cent. He then referred at some length to the parliamentary proceedings of the past year, giving it as his opinion that the companies had not been fairly dealt with, inasmuch as they had been treated as though they were public servants expending public money, instead of trading companies having private funds to administer. He complained that the parliamentary committee had been opposed to the gas companies from the first. He believed that if the companies were left to conduct their own affairs without interference, it would be greatly to the advantage of the public at large. The House of Commons seemed to forget how long the companies had paid no dividend at all, and that the average dividend of the Western had been 5½ per cent. Those who were loudest in their complaints about dividends would be little prepared to receive only the same rate upon any capital they had embarked in their individual undertakings.

Mr. L. Simpson seconded the motion.

Mr. Slater thought the amount of bad debts was highly satisfactory, being only £588; and called attention to the item "Sundry creditors, £14,587."

Mr. Doane asked whether the companies had done anything towards amalgamation.

Some discussion ensued relative to the gas stokers and their grievances.

A Shareholder thought that the gas stokers had no real grievances to complain of, and that the whole story of the wrongs which had so alarmed the public was a pure fabrication. He had never before heard any complaints from the gas stokers until some self-appointed or self-dubbed "friends of the working man" came before the public with the highly coloured picture of wrongs. He had for the greater part of his life been connected with gas-works in one way or another, and had heard no complaint from the men. They were not overworked, and were very well paid. They were not mechanics or artisans, but labourers, and in comparison with other labourers had a very good time of it, and were well paid.

Mr. Wilmot Knight referred to the item "Parliamentary and incidental expenses," £1873, and inquired how much was due to "parliamentary" expenses proper. He also asked what was the current rate which the company was paying upon its loans in these days of a money plethora. Referring to the agitation going on among the gas stokers, he said that he had been a friend and advocate of the working man all his life, but he thought the gas stokers

had a very bad case, notwithstanding "A Stoker's" letter published in that day's papers. He considered that the secretary of the Chartered Gas Company (Mr. Phillips) had put the question in its proper form when he said it was for the gas stokers to choose between the arbitrement of force and the arbitrement of kindness. It should not be forgotten that the occupation of a gas-stoker did not require any large degree of mental or manual skill. All that was required was a given amount of strength, and certain powers of endurance. These lessons the artisans of the East-end of London—in Poplar, Limehouse, and Blackwall, for instance—had been learning to their sad cost for some time, and should the gas stokers be so foolish as to do anything rashly, should they not know how to be wise in time, they would find the unemployed of Whitechapel and other places he had named only too ready to fill the positions that the gas stokers could more easily abandon than regain.

Mr. A. GRAY said the price of gas in the City had been reduced voluntarily from 10s. to 4s. per 1000 cubic feet, and he deprecated the constant attempts made to undo a parliamentary compact. He did not believe that amalgamation would reduce the price 2d. per 1000. With regard to the stokers, he was prepared, not only as a shareholder in this but as chairman of another gas company, to deny the allegations brought against the gas companies. Having made himself acquainted with the details in reference to this question, he found that in his company they did not work more than four hours out of the twelve, and that at intermittent periods of a half hour or so at a stretch. Those speakers at the meeting who stated that the men were at work 12 hours out of the 24, said what was not borne out by facts. His experience proved to him that there was no body of men who lived by labour who did less for their money than the gas stokers. If they were so foolish as to throw up their employment, their places could and would be filled up in a few hours.

The CHAIRMAN, in reply to the questions which had been put, said the company only exercised its borrowing powers as the business extended. The parliamentary expenses had been £1200, and the average rate of interest on loans was 4¾ per cent. He agreed with Mr. Gray on the subject of amalgamation, and did not think it would effect the reduction supposed; but the directors of the various companies were quite ready to do anything that should be proved to be desirable. He thought, also, that Mr. Knight had taken a right view of the question in reference to the gas stokers; and he was confident that if all the facts were known the public would conclude that the labours of the gas stokers were not at all heavy, and that the men were very fairly remunerated. The whole labour the gas stokers gave did not exceed 6 hours out of the 24. The men were obliged to be 12 hours on the premises, but they were not at work for more than 6. They did not even work the whole six hours at a stretch, but in turns of never more than three-quarters or an hour at a time. As for men being carried away from their work in a fainting state, that was moonshine, for the improvements in modern science had enabled the gas companies very greatly to counteract the heat to which the men would otherwise be exposed. As to the heat affecting their health, statistics proved that a more brawny or healthy race of labourers did not exist. Six hours work could not be considered hard, and the men had plenty of time on their hands. As to a high rate of dividend being wrung for the shareholders out of the bones of the gas stokers, the whole dividend paid by this company since its commencement was not more than 5½ per cent.

The motion for the adoption of the report was then put and carried unanimously, and the dividends recommended in the report were agreed to.

The retiring directors and auditors having been re-elected, a vote of thanks to the directors concluded the proceedings.

OTTOMAN GAS COMPANY, LIMITED.

The Tenth Ordinary Meeting of the Shareholders of this Company was held at the City Terminus Hotel, Cannon Street, London, on Friday, Aug. 30—S. A. BECK, Esq., in the chair.

The SECRETARY (Mr. A. J. King) read the advertisement convening the meeting, and the following report and statement of accounts were then presented:—

Your directors herewith present the audited statement of accounts for the past half year, showing a net profit of £262 19s. 1d., after payment of interest on debentures.

At the last general meeting it was announced that the public lighting of the town had been resumed at the urgent request of His Excellency the Governor, and upon the faith of his assurance that he would use all his influence to bring about an adjustment of the points at issue, and to secure the payment of the arrears. Your directors regret to have to announce that these promises have not realized the expectation formed upon them, and although about £700 has been received, the amount since accrued has somewhat exceeded that sum, leaving the amount still due £2461 1s. 5d., the non-payment of which is a source of great embarrassment to the company. Your directors have, therefore, felt compelled again to discontinue the public lighting, except in those streets in which the arrears have been entirely paid; and it is not their intention in any case to relight on any other conditions.

The private lighting shows a moderate improvement, being £1401, against £1048 for the corresponding period of 1866, an increase, however, of only £4 on the half year ending at Christmas. This small increase may be referred to the extremely depressed state of business in Smyrna. A successful harvest in all the chief products of the country is now doing much to relieve the prevalent distress, and business is assuming a more healthy appearance, and your directors have reason to anticipate a more marked increase of business in the current half year.

The debentures authorized by the special resolution of the extraordinary general meeting of the company, October 19th, 1864, begin to mature next November, and it will be necessary to make arrangements, either for their renewal or replacement by other means. The meeting of the 30th will be made an extraordinary general meeting, in order to obtain the necessary powers for so doing.

Dr. *Balance-Sheet, June 30, 1867.* *Cr.*

To Capital			£30,000 0 0	By Plant	£40,272 2 3
Debentures			13,450 0 0	Concession and preliminary expenses	16,888 9 10
Sundry creditors			2,813 8 7	Stocks	4,923 14 10
Profit and loss.	£262 19 1			Amount owing for public lights	2,461 1 5
Less balance from last account	89 6 5		173 12 8	Sundry debtors	1,068 16 4
				Bills receivable	200 0 0
				Cash	498 6 4
				Office furniture	124 10 3
			£66,437 1 3		£66,437 1 3

Dr. *Profit and Loss Account, June 30, 1867.* *Cr.*

To Cost of coals	£ 897 16 9			By Gas-rentals—		
Wages and expenses, Smyrna	820 10 10			General consumers	£1,401 0 0	
		£1,718 7 7		Public lights	850 3 7	
Directors fees				Coke and tar	279 1 5	
Interest on debentures		403 10 0				£2,530 5 0
Exchange account		64 3 7		Net profit on chandeliers and fittings		170 9 3
Bad debts and allowances		19 3 5		Transfer fees		1 10 0
Depreciation of meters at rental		19 3 8		Interest		2 11 10
Auditors		10 10 0				
Rent, salaries, printing, stationery, and office expenses, London		206 18 9				
Balance—profit		262 19 1				
		£2,704 16 1				£2,704 16 1

The CHAIRMAN, in moving the adoption of the report, said he had only a very few observations to make, for really there had been little or no alteration in the position of the company since the shareholders last met. He was sorry to say the directors had still great difficulty in obtaining payment of their just debts from the authorities in Smyrna on account of the lighting of the streets, although they had done everything they possibly could to hasten a settlement. In fact, the company were £100 worse off now than they were six months ago, for though they had received £700, the amount which had since accrued exceeded that payment. The board had, therefore, cut off the supply to every street except those for which they had received the full amount due. These had been continued in the hope that an inducement would be thereby offered to other portions of the city to follow the example, and pay off their debts. The directors applied, through the Turkish ambassador, to the Sultan when he was in this country, asking for an interview, hoping that they might induce him to take steps to compel the authorities to pay what was due to the company. But the Sultan declined seeing them, and therefore they could do nothing further. They had since entered into negotiations with a very influential gentleman at Smyrna, with the object of interesting him in securing a settlement. They hoped some measure of success would attend this step, but it was, after all, very problematical indeed, and he (the chairman) could not hold out any prospect in any way to the shareholders. He felt they had been so totally deceived in the inhabitants of Smyrna that it was impossible to say what would be the issue. The private lighting had increased but very little since the last half year, and therefore there was nothing further to say in reference to the company's affairs, except to assure the shareholders that the directors would leave no means untried to obtain payment of the amount due to them for the public lighting, and to improve and extend the private supply.

Mr. HORNER seconded the motion.

Mr. LYSLEY asked whether any attempt had been made to introduce gas cooking-stoves into Smyrna, and, if so, with what result.

The CHAIRMAN said the attempt had been made, but was not at present very successful; still he thought that, after a while, these stoves would push their way into use. The directors, he thought, had exhausted every means to place the company in a more satisfactory position. They had endeavoured to secure the services of two or three influential gentlemen at Smyrna, but the difficulty they had to contend with was this, that in order to secure their services the remuneration asked was such that they did not feel justified in completing any such arrangement. At the present moment the directors were under personal liability to the bankers for £1000 on account of the company.

Mr. LYSLEY said if the remuneration of the gentlemen referred to had been made to depend upon the amount recovered by the company, there could be no difficulty in the matter.

The CHAIRMAN said they would not take a per centage upon the amount received, and it was upon that point that the negotiations broke off.

Mr. WILLIAMS asked who it was that inserted a paragraph in the *Times*, about three months ago, stating that the arrears due to the company were about to be paid, and that in future the public lighting account at Smyrna was to be paid quarterly.

Mr. HORNER said the statement did not emanate from the board, but was inserted by the writer on his own responsibility.

Mr. WILLIAMS regretted that so erroneous and misleading a statement had been published, and said that a friend of his had been tempted to purchase debentures upon the faith of it.

The CHAIRMAN said it was a most improper statement to make, but the directors were in no sense responsible for it. They had carefully avoided publishing a line.

Mr. WILLIAMS said he was surprised that, the chairman being so completely *au fait* at gas making, the carbonizing department of this company was so ill conducted that, according to the report of their consulting engineer, they were losing 4000 cubic feet of gas per ton of coal.

Mr. UPWARD denied that he had made such a statement.

Mr. WILLIAMS quoted at some length from Mr. Upward's report to prove the truth of his position.

Mr. HORNER said that report referred to the state of things in 1864, and had no bearing at all upon the state of things at the present moment. If Mr. Williams had taken the trouble to ascertain the facts, he would have found that during the last six months the make of gas had generally exceeded 9000 feet per ton of coals. Whenever it was below that figure it was because the company were short of Newcastle coal, and had to use some of the native coal, which only produced 4000 or 5000 feet per ton. With regard to the affairs of the company generally, he must say that he thought nothing was to be gained by depreciating everything, and trying to pull it to pieces. The shareholders must endeavour to pull together, and give the directors all the support in their power. The directors devoted a great deal of time to the interests of the concern, for which they got nothing; they were also under personal responsibility to a considerable amount, and they had a right to expect the confidence and support of the shareholders.

The CHAIRMAN showed from the accounts supplied by Mr. Gandon for the last three years that the statements made by Mr. Williams were entirely erroneous as to the results of the carbonizing.

Mr. UPWARD said he thought the half-yearly accounts presented to the shareholders showed that a great improvement had taken place.

A PROPRIETOR asked at what price gas was supplied in Smyrna.

The CHAIRMAN said by the concession the company were entitled to charge 13s. 6d. per 1000 cubic feet to private consumers, but the actual charge was only 10s. The public lights were charged at the rate of 7010 piastres, which, allowing for the charges on collection and the losses they anticipated, came out at 8s. 2d., but up to the present time the allowances had always been very much exceeded. The directors had had it in contemplation to reduce the price, hoping thereby to force the consumption, but gentlemen from Smyrna whom they had consulted advised them that it would not have the smallest effect.

Mr. WILLIAMS asked whether in the opinion of the board the company ever would answer.

The CHAIRMAN replied that he thought it would, but it might take some time to make it remunerative.

After some further conversation, the resolution was put and carried.

The meeting was then made special, and on the motion of the CHAIRMAN, seconded by Mr. HORNER, the following resolution was adopted:—"That, to enable the directors to meet at maturity the debentures issued under the special resolution of the meeting held October 19, 1864, the board be authorized to raise a sum not exceeding £15,000, by the issue of preference shares or debentures (or partly preference shares and partly debentures) for such periods and on such terms as the board shall think fit."

On the motion of Mr. GIBBON, a vote of thanks was given to the directors, which the CHAIRMAN having acknowledged, the proceedings terminated.

THE GAS PRODUCTS UTILIZING COMPANY, LIMITED.

The Sixth Ordinary General Meeting of the Shareholders of this Company was held at the Works, Bow Common Lane, on Friday, Aug. 23—A. A. CROLL, Esq., in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting, after which the following report was presented:—

The directors submit the statement of accounts and balance-sheet, duly audited by Messrs. Quilter, Ball, and Co., and the shareholders auditor, for the half year ending the 30th of June, 1867.

The result of the half year's working shows a profit of £2745 4s., which, added to £5646 12s. 3d. previously reserved, makes a total of £8391 16s. 3d.

The shareholders will remember that at the last meeting the directors reported a probable loss of about £3000, arising from a disputed contract for one of the raw materials. This dispute has since that time been arranged by compromise, the directors considering it more prudent to stay the loss at the exact sum of £2920 rather than encounter the uncertain results of an action at law. With regard to the amount in question it is entirely exceptional, and it would unfairly prejudice the manufacturing account to bring the whole charge against any one half year's working.

The directors therefore propose to spread it over three half years, and £1000 is consequently placed against present revenue. This reduces the available balance to £7391 16s. 3d., and when the usual dividend of 10 per cent. per annum is paid, the amount of undivided profit will be £3525 4s. 5d.

The shareholders will, it is hoped, not be dissatisfied with the revenue statement when it is borne in mind that the general depression in manufacturing and mercantile affairs which characterized the year 1866 has been in operation with equal severity throughout the first half of 1867; every article produced by the company has during the period been in slack demand and comparatively low in price. It may be expected that trade will soon revive, and if so the company will instantly feel its beneficial effect.

The extension of the works at Glasgow, mentioned in the last report, has proceeded satisfactorily. There has been £4629 13s. 2d. of capital expended there during the half year—viz., £3129 13s. 2d. disbursed directly from London, and £1500 included in the general charges in Glasgow, and which is applicable to the construction of plant there.

The directors have to intimate that there will be a call of £1 per share on the 2500 shares last issued, £1 paid, which call will be payable at the end of September next.

The directors regret to announce the decease of D. Methven, Esq., one of the auditors. The vacancy thus caused the directors do not recommend shall be filled up.

The CHAIRMAN, in moving the adoption of the report, expressed the satisfaction the directors felt in meeting the shareholders upon their own freehold property, and in laying before them a statement of their affairs for the six months ending June 30, 1867. The principal cause of regret was the serious loss sustained upon the contract referred to as in suspense in the last report. The directors had no reason to expect that the company would again be subject to such a drawback, and, under the exceptional circumstances of the case, he hoped the shareholders would approve the course recommended by the directors to spread the loss over three half years. He congratulated the company on their possession of the works at Glasgow, and pointed out some of the advantages which those works offered. Amongst others, he mentioned that in the article of fuel, it was found underneath the works, and cost the company only some 5s. or 6s. per ton. With regard to labour, it was not anything like so high at Glasgow as in London, and, looking at all the circumstances of the case, he thought he was justified in saying that the purchase of those works was a very good investment. It was stated in the report that in consequence of the general depression in mercantile and commercial affairs, every article produced by the company had been during the past half year in slack demand and comparatively low in price. He might state, by way of illustration, that naphtha, which at the time the company took these works was selling at from 1s. 8d. to 2s. per gallon, was worth now only about 6d. per gallon. This arose from the enormous quantity of petroleum imported from America, which itself had become quite a drug in the market. The shareholders had probably seen an article recently copied from a Pittsburg paper. The directors intended to wait for a month or two, and they hoped then to derive the advantage indicated by the statement made in that article. The accounts now laid before the meeting were based upon the calculation of taking the naphtha in stock at 6d. per gallon, and selling the pitch at 23s. per ton. But he was happy to state that the directors had that week made a contract for the next twelve months to dispose of all the pitch made on the works at 45s. per ton. Looking at these facts and other circumstances, he had every confidence in expressing his opinion that though the result of the past six months working was not so satisfactory as the directors had expected, they hoped at the next meeting to present a report equal, at least, to any they had hitherto submitted. With reference to the capital of the company, it had been increased £3283 in the six months. During the same period they had expended upon extensions in Glasgow and London £5810 4s. 2d., and at the same time they had reduced their liabilities to the extent of £5921 14s. With these few remarks he begged to move—"That the report and accounts be received and adopted." The directors believing that the report would be accepted, had had the warrants for the dividends prepared, so that the shareholders could receive them before leaving the meeting.

Mr. COHEN seconded the motion, and congratulated the directors on the success of the undertaking notwithstanding all the drawbacks referred to.

Mr. PURVIS asked the amount required to pay the dividend.

The CHAIRMAN said, at 10 per cent. the dividend came to £3866 11s. 10d., and he thought he might congratulate the shareholders upon the fact that, notwithstanding the serious loss referred to, and the bad state of trade for the past twelve months, they had been able to continue the payment of the usual dividend, and still had £3525 as undivided profit, and that too after writing off the whole of the preliminary expenses.

The motion was then put and carried unanimously.

Mr. COHEN said the directors, in the report, stated that it was not intended to fill up the vacancy in the auditorship. He, for one, did not see the necessity for so doing, but he should like to know whether it was not required by the Articles of Association, as from the commencement of the company's operations there had always been two auditors.

The CHAIRMAN said his answer was simply this, that at the time the company was formed it was never intended to have professional auditors as they now had. Of course, the directors had no objection to the vacancy being filled up; their recommendation was based solely on the ground of expense. If the shareholders desired it they could appoint another auditor, but looking at the rigid scrutiny to which the company's books were subject, it did seem to him to be an unnecessary expense.

Mr. BUSS moved a vote of thanks to the directors. He thought after the reports and statements laid before the meeting the shareholders had every reason to believe the directors had done their duty.

Mr. PURVIS seconded the motion, which was unanimously adopted.

The CHAIRMAN said the directors were much gratified with this kind expression of the shareholders satisfaction and confidence, and they would continue to devote their best attention to the interests of the company.

Mr. COHEN proposed, and Mr. DWARBER seconded, a vote of thanks to the secretary for the zeal and ability displayed by him in the fulfilment of his duties.

The motion was very cordially adopted.

Mr. GUYATT acknowledged the vote, and the proceedings terminated.

After the meeting the directors invited the shareholders to inspect the works. This they did, the several processes carried on being explained by Mr. Croll.

BRIGHTON GAS COMPANY.

At the Half-Yearly meeting of this Company, held at the Office, St. Swithin's Lane, Cannon Street—Mr. WHEELER in the chair,

The report stated that the prices received for residual products during the past six months had been considerably depressed, but, nevertheless, the directors were enabled to recommend a dividend at the rate of 5 per cent. per annum. The arrangements to meet the winter supply were far in advance, and the demand for gas was on the increase.

The CHAIRMAN, in moving the adoption of the report, regretted that it was not more favourable, but entertained a hope that in the future the price of coke and other products would be enhanced. Although he could not hold out the expectation that they would return to a 10 per cent. dividend, still he believed that their prospects were encouraging, and that improvement might fairly be looked for.

The motion for the adoption of the report was seconded by the DEPUTY-CHAIRMAN.

Mr. WILMOT KNIGHT inquired how it happened that so large a sum appeared in the accounts under the head of "Donations and subscriptions."

The CHAIRMAN replied that it was composed of sums given to the hospital and other local objects, and the directors exercised every economy in that respect.

The resolution for the adoption of the report then passed *nem. dis.*

Mr. WILMOT KNIGHT then moved a resolution to the effect that the meeting was of opinion that it would be highly desirable for the directors to print and circulate the report and statement of accounts among the proprietors at least one week previously to the half-yearly meeting of the company. He expressed great respect for the board, but was not prepared to yield a blind confidence to any set of men. He regretted that so few proprietors were present; and on behalf of those shareholders who were non-resident in London, and unable to attend, he hoped the proprietary would vote for his motion.

Mr. MAUGHAN (auditor) seconded the motion. He did not anticipate any injury as likely to result from the publication of the accounts, but he believed publicity would tend to dispel those misconceptions the Brighton people entertained as to the profit which the company was making, and prove that it would be utterly futile for a third company to commence operations in opposition.

Considerable discussion ensued. The chairman and some other directors expressed themselves decidedly averse to the motion; but upon a show of hands it was carried by a majority of one.

A resolution authorizing the board to borrow £5000 for the purposes of the company was carried unanimously, the retiring directors and auditor were re-elected, and the proceedings concluded with a vote of thanks to the chairman and directors.

MEETING OF THE GAS STOKERS.—An aggregate meeting of the men employed as gas stokers in the various metropolitan gas manufactories was held last night at the Cambridge Hall, Newman Street, Oxford Street, for the purpose of adopting measures to procure a reduction of their hours of labour from 84 to 56 per week. About 1500 men were present, being those employed at day work. Mr. George Potter occupied the chair. The chairman said, as one who had taken a prominent part in obtaining a reduction of the hours of labour, he had been asked by the Stokers Committee to preside on the present occasion. He understood there were about 4000 gas stokers working in the metropolis, one portion working 12 hours per day, Sunday included, and the other portion working the same number of hours per night, making a week's work of seven days, or 84 hours per week. The men desired to reduce their excessive hours of labour, and that instead of being divided into two portions, working 12 hours each day or night, there should be three divisions, each division working but eight hours, which would make the working hours of each man but eight, being 56 per week of seven days. This desire had been embodied by the men at each factory in a memorial which had been presented by them to the various managers, with a request that they would lay it before the boards of directors. In almost every case the managers had refused to do this, and hence the present meeting, for the purpose of seeing if combined action would effect what individual efforts had failed to accomplish. Mr. T. Holden then moved the following resolution:—"That this meeting deplores the fact that the gas stokers of the metropolis are required to work 84 hours per week, half naked, before great fires, and that the demand by them for the limitation of the hours of labour to 56 is a reasonable request, and absolutely necessary for the physical, moral, and social welfare of the men." He was able to speak from personal knowledge of the injurious effect of these long hours upon the men subjected to them. He had repeatedly seen men carried out of the yard fainting from the overwork and ex-

ertion. Only last week, at the Fulham works, so many men were taken away exhausted that there were not enough left to make up the gang necessary to carry on the work. If the directors would not entertain their memorial, then they must appeal to the shareholders, a large proportion of whom in gas companies were ladies and clergymen, to forego a small portion of their 10 per cent. dividends and bonuses in order that the men who produced the dividends might be enabled to work a reasonable number of hours. Mr. James Conolly seconded the resolution. As one who daily went through this excessive toil he felt it his duty to do all in his power to provide a remedy. It was monstrous that any man should have to work 12 hours per day for seven days in the week in an atmosphere at a temperature of 180°. The resolution was carried unanimously. Mr. Knight moved a resolution declaring the determination of the meeting to continue its demand for the 8 hours system, and appointing a committee to confer with the directors of the companies on the subject, such committee to report the result of their labours at a future meeting. Mr. Webb seconded the resolution, which was supported by Mr. Gilmore, and carried. The committee was then appointed, consisting of one representative from each gas company, and the meeting concluded with a vote of thanks to the chairman.—*Times.*

CALVERLEY—ALLEGED ILLEGAL BREAKING UP OF THE HIGHWAYS.—It will be remembered that about a fortnight ago William Kelly, and ten other persons, were committed by the West Riding magistrates at Bradford, for causing a nuisance in breaking up the highways at Calverley in the month of April last. A true bill was found by the grand jury at the Leeds Assizes on Monday week. On Saturday last an application was made by Mr. Price, Q.C., as counsel for the defendants, that the case should be postponed until the next assizes. In support of the application an affidavit was handed to the court, and in granting the application Mr. Justice Lush said: "I think this application ought to be granted. I have carefully considered the depositions in this case, as well as the affidavit made on behalf of the defendants. It appears that this is a prosecution instituted by the Pudsey Gas Company. This company many years ago obtained an Act of Parliament enabling them to lay pipes and carry out works for the purpose of supplying the district of Calverley with gas. After this Act was obtained, for ten years, although applied to more than once by the Calverley people, they neglected or refused to supply gas to this district. The Calverley people at length formed a company of their own about ten years ago, and laid down mains. They experienced no opposition from any one. Last April they found it necessary to extend their mains to a mill belonging to a person who employed a great number of hands. For this purpose it was necessary to take up a certain portion of the highway. This was done and completed in two or three days with the consent of the local board, who were also the surveyors of the highways; no person in the place opposed it in any way, and no real injury was done to the public. No proceedings were taken by any one until two days before these assizes, when the defendants were summoned before a magistrate. This prosecution by the Pudsey Company is instituted not to protect the public, but to oppress a rival gas company, and for no other purpose; and is, in my opinion, an abuse of the criminal law. The case must stand over until next assizes, to enable the defendants, if they please, either to apply for an Act of Parliament or for a *certiorari.*" After the judgment, Mr. Overend, Q.C., and Mr. Shaw, were re-instructed by Mr. G. R. Mossman, jun., solicitor, of Bradford, on behalf of the Pudsey Gas Company; and Mr. Terry, solicitor, of Bradford, on behalf of the Calverley Gas Company, instructed Mr. Price, Q.C., and Mr. Mellor, as counsel for the defendants.

Share List of Metropolitan Gas Companies.

No. of Shares issued.	Amount per Share.	Name of Company.	Amount paid up per Share.	Div. per Cent. per Annum	Price per Share.
	£		£ s d	£ s d	£ s d
8000	10	Anglo-Romano . .	10 0 0	9 0 0	11 to 12
5000	20	Bahia (Limited) . .	20 0 0	nil.	16 10 0
1000	20	Do., preference .	20 0 0	10 0 0	27 10 0
750	20	Do., do., redeem.	10 0 0	10 0 0	12 10 0
40000	5	Bombay (Limited).	5 0 0	5 0 0	2½ to 2¾
10000	5	Do., third issue .	3 0 0	5 0 0	3⅛ to 3½
10000	20	British, Limited . (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge, & Holywell.)	20 0 0	6 0 0	28 to 29
12000	50	*Chartered*	50 0 0	8 10 0	53 to 54
6000	50	Do.	40 0 0	8 10 0	42 to 43
10000	20	*City of London,* A shares	20 0 0	9 0 0	23 to 25
10000	10	Do., B shares	10 0 0	4 0 0	6½ to 7
9629	10	Do., new shares.	10 0 0	9 0 0	11½ to 12½
25000	25	City of Moscow (L)	25 0 0	£7 intr.	15 to 16
17490	25	*Commercial* . . .	25 0 0	10 0 0	31 to 32
2500	20	Continental Union.	20 0 0	8 0 0	13 to 14
17500	20	Do.	15 0 0	8 0 0	9 to 10
10000	20	Do., preference .	20 0 0	7 0 0	
5827	5	County & Gen. (L)	5 0 0	nil.	
2000	5	Do., preference . (Pater, Pembroke, Ely, Lea Bridge, Northfleet, Walton, & Ware.)	5 0 0	nil.	
5000	10	*Crystal Pal. Dist.*	10 0 0	10 0 0	13 to 14
5000	10	Do., preference .	10 0 0	6 0 0	12½ to 13
10000	10	Do., new shares .	2 10 0	7 0 0	2½ to 3
4000	50	*Equitable*	50 0 0	10 0 0	65 to 66
4000	25	Do., new shares.	25 0 0	10 0 0	33 to 34
23406	10	European (Lim.) .	10 0 0	10 0 0	13½ to 14
12000	10	Do., new shares. (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	10 0 0	6¼ to 7
20000	10	*Gt. Cent. Gas Cons.*	10 0 0	10 0 0	12½ to 13⅛
5000	10	Hong Kong (Lim.)	10 0 0		8 to 10
26000	50	*Imperial*, old sh.	50 0 0	10 0 0	64 to 64½
1300	100	Do., bonds . . .	£100	10 0 0	170 to 172
2391	25	Imperial Austrian.	25 0 0	nil.	
28000	50	*Impl. Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwp., Bordeaux, Brussels, Cologne, Frankfort-on-M., Haarlem, Stolberg, Toulouse, & Vienna	43 15 0	16 0 0	97 to 97½
400	100	Impl. Mexican (L.)	75 0 0		
3000	40	*Independent* . . .	40 0 0	10 0 0	50 to 53
3000	10	Do.	10 0 0	5 0 0	7 to 9
3000	20	Do.	12 10 0	7 10 0	13 to 14
7133	50	*London*	50 0 0	10 0 0	62 to 63
5610	25	Do., 1st pref. .	25 0 0	6 0 0	25 to 26
503	50	Do., 2nd pref. .	50 0 0	6 0 0	
214	50	Do., 3rd pref. .	50 0 0	6 0 0	
18781 sh		Do., 1st pref. sh		6 0 0	
11828 sh		Do., 2nd pref. sh		5 0 0	
12000	5	Malta & Medit. (L.)	5 0 0	4 0 0	3¼ to 4
6000	5	Do., preference .	5 0 0	7 0 0	5 0 0
30000	5	Oriental, Calcutta	5 0 0	8 10 0	5⅛ to 5⅜
30000	5	Do., new shares.	1 0 0	8 10 0	1 to 1⅛
10000	5	Ottoman (Limited)	5 0 0	nil.	1¼ to 2½
10000	10	Pará (Limited) . .	10 0 0	6 0 0	9½ to 9⅝
27000	20	*Phœnix*	20 0 0	10 0 0	25 to 25½
3600	100	Do., new	25 0 0	7 10 0	24½ to 25¼
144000	Sk.	Do.	100 0 0	5 0 0	70 to 71
5000	20	*Ratcliff*	20 0 0	10 0 0	22 to 24
	20	Rio de Janeiro (L).	20 0 0	10 0 0	21¼ to 22½
6959	5	Singapore (Lim.) .	5 0 0	3 10 0	
2000	5	Do., preference . Shanghai	5 0 0	7 10 0	
4800	50	*Sth. Metropolitan*	50 0 0	10 0 0	71 to 72
15000	10	*Surrey Consumers*	10 0 0	9 0 0	12⅝ to 13
10000	10	Do., new	6 0 0	9 0 0	7½ to 8
9000	4	United General . . (Limerick)	4 0 0		2 to 2¼
10000	10	*Victoria Docks.* .	5 0 0	6 0 0	
3000	10	*Wandsworth & Putney*	10 0 0	7 10 0	13½ to 14
20000	10	Western (L.) A sh.	10 0 0	10 0 0	13½ to 14
10000	10	Do., B shares.	5 0 0	10 0 0	6⅝ to 7
10000	10	Do., C shares.	5 0 0	10 0 0	6½ to 7
20000	10	Do., D shares.	1 0 0	10 0 0	1½ to 2
8000	5	*West Ham*	5 0 0	7 10 0	6 10 0
6000	5	Do., new shares.	3 0 0	7 10 0	3 18 0
551	10	West London Junction (Lim.) . .	10 0 0	6 0 0	
520	10	Do., preference .	10 0 0	6 0 0	

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 15 0	2 14 9	2 12 6	3 10 0	3 10 0
1¼ and 2-inch Socket-pipes	7 10 0	6 0 0	6 15 0	6 15 0	7 10 0
2½ and 3-inch ditto	7 0 0	6 0 0	6 5 0	6 10 0	7 0 0
4 and 5-inch ditto	6 10 0	5 10 0	5 15 0	6 0 0	6 10 0
6 inches and upwards ditto	6 5 0	5 0 0	5 10 0	5 15 0	6 5 0
Retorts, 1st fusion, hot blast	6 0 0	—	5 5 0	5 10 0	6 0 0
Ditto, 2nd ditto, cold ditto	7 0 0	5 15 0	5 15 0	6 0 0	7 0 0
Tank-plates, ¾ thick and above	6 10 0	5 10 0	5 10 0	5 15 0	6 5 0

WROUGHT-IRON TUBING,

Subject to 50 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

GAS COALS.—*Per Ton.*

Newcastle.—Unscreened:—

East Castle, Haswells, Nettlesworth Primrose, and South Pelaw	7s. 6d.
Felling, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	7 9
Burnhope, Craghead, Charlaw, Derwent, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	8 0
Peareth, Ravensworth Pelaw, Waldridge, West Gureshield, and West Pelton	8 3
Brancepeth, Dean's Primrose, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	8 6
Ramsay's Newcastle Cannel	20 0
Wigan Cannel (at Liverpool)	17 0

Scotch Cannel:—

Boghead (at Leith)	50 0
Kirkness, best (at Burntisland)	28 6
Capeldrae, 1st quality (at ditto)	28 6
Ditto, 2nd ditto (at ditto)	18 6
Cowdenbeath	12 0
Lesmahago (at Glasgow)	31 6
Ditto (at Granton)	32 6
Arniston	27 6
Wemyss	20 0
Haywood, Wilsontown (at Granton)	23 0
Pirnie, or Methill	15 0
Lothian's Cannel (at Leith)	28 0
Myles' Cannel	23 6

FREIGHTS.

Coastwise—Newcastle.—Per Ton:—

Chatham and Rochester	6 0d
Cork	9s. to 9 6
Dover, Folkestne, & Rgte.	6s. 4½d. to 6 6
Dublin	9s. 6d. to 10 0
Exeter Quay	8 6
Ipswich	5 0
London (from Leith)	8 0
London (Pool)	6 0
Lowestoft and Yarmouth	4 9
Portsmouth & Southampton	7 0
Plymouth	7 6
Shoreham	6 9
Whitstable	6 0
Weymouth	7 3

Foreign.—Per Keel:—

Barcelona	£19 0
Bordeaux	13 10
Boulogne and Calais	7 0
Cadiz	13 10
Cronstadt	10 5
Copenhagen	9 10
Genoa	18 0
Hamburg	8 0
Havre de Grace	8 15
Leghorn	16 0
Lisbon	14 0
Rotterdam	7 15
Stettin	10 0
Trieste	12 10
Venice	15 10

SUNDRIES.

Best Natle. Fire-bks., p. 1000, £2 10s. to £2	15 0
Cliff's Fire-bks. (at Wortley), p. 1000.	2 15 0
Ingham's ditto (at Wortley), p. 1000.	2 15 0
Fire-clay Retorts, p. ft. run, 5s. 6d. to	0 7 0
Tough Cake Copper, p. ton	84 0 0
English Pig Lead, p. ton	19 15 0
English Sheet Lead, p. ton	20 0 0
Welsh Bar Iron (in London), p. ton	6 10 0
Foreign Spelter, p. ton	20 17 6
English Block Tin, p. ton	93 0 0
Banca, p. ton	94 0 0
Tarred Rope Yarn, p. cwt.	1 0 0

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

JOHN VICKARY,

GAS ENGINEER AND CONTRACTOR, IRON AND BRASS FOUNDER,

WORKS—EXE ISLAND, EXETER,

Tenders his best thanks to the various Gas Companies in **England, Ireland, and Wales,** for the very liberal and kind support he has received for the last **22 years,** during which period he has erected and extended above **200 Gas-Works.**

In addition to the numerous towns wherein he has been engaged, he begs reference to the following testimonial:—

Plymouth and Stonehouse Gaslight and Coke Company.

Sir,—I have much pleasure in testifying that the 100-foot Telescope Gasholder and Cast-Iron Tank, erected by you for this Company in 1862, has given the highest satisfaction, and never required the slightest attention or adjustment since its completion.

(Signed) PETER ADAMS, Chairman.

He has also erected a 100-foot Gasholder and Cast-Iron Tank at **Exeter;** an 80-foot Telescope Gasholder and Iron Tank at **Devonport;** a 90-foot at **Torquay,** &c. &c. At either of those works satisfactory references can be made.

He also begs particular attention to his **Improved Gas-Meters,** either **Wet, Dry, or Compensating,** the materials and workmanship of which guaranteed of the very best description, and which has gained for his Meters so excellent a reputation for these last **20 years.**

RETORTS, DIP & ASCENSION PIPES, HYDRAULIC MAIN, CONDENSERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, and GASHOLDERS,

Of any size, and every description of article required in Gas-Works.

Mains, Tees, Connexions, and Syphons, from 2 to 12 in., always in stock, and supplied at Scotch prices.

Clay Retorts and Fire-Goods of every description.

Gas-Fittings of the most modern designs.

Iron Pipe and Fittings, Service Cocks, &c.

Plans, Specifications, and Estimate for the erection of New Gas-Works of any size furnished.

GAS EXPLOSIONS PREVENTED

BY THE USE OF

JOHN RUSSELL & CO.'S TUBES & FITTINGS.

Gas Explosions are of frequent occurrence, but we do not hear of them unless death has resulted. As in the case at Clerkenwell lately, gas explosions may generally be traced to the use of Tubes of defective workmanship and inferior iron. Adopt the Tubes and Fittings of John Russell and Co., which are all of the best quality.

JOHN RUSSELL & CO.

ARE THE

INVENTORS OF THE LAP-WELDED TUBE FOR LOCOMOTIVE & MARINE BOILERS,

AND THE OLDEST MANUFACTURERS OF TUBES FOR GAS, STEAM, & WATER.

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69, Upper Thames Street, E.C.; Commercial Street, N.E.; & Charles Street, Soho Square, London; Also at 35, 36, 37, and 39, Granby Row, Manchester.

MANUFACTORIES:

The Old Tube Works, Wednesbury, and the Alma Works, Walsall, Staffordshire.

Address to 69, UPPER THAMES STREET, LONDON, E.C.

THE ONLY COMPLETE CAST-IRON CASED DRY GAS-METER,

PATENTED MARCH 31, 1865.

Gas Engineers and others will find that the above Meter is made of the most durable material, also that it can be repaired at a fraction of the cost of any other Meter now manufactured; all the interior fittings, as well as the case, being fitted together with screws.

Drawings explanatory of the above on application.

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Station-Meters and Gas Apparatus, Consumers Wet Gas-Meters in Cast-Iron, and Dry in Tin Plate Cases.

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WANTED, a thoroughly competent GENERAL MANAGER for a water-works in a country town supplied from deep wells by steam-driven pumps. He must be acquainted with the working and management of steam-engines, pumps, hydraulic fittings, and filter-beds, and fully conversant with the distribution of water on the constant system, and with the regulations adapted in the best managed modern water-works.

Applications, stating qualifications and salary expected, to be sent to JAMES FARRAR, Engineering Surveyor, Bury, LANCASHIRE.

WANTED, by a young Man, married, a Situation as MANAGER of a gas-work. Is a practical gas engineer, and has a knowledge of book-keeping; can show first-class testimonials, and give good references.

Address G. M., No. 1, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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THE Advertiser is desirous of an engagement as MANAGER. Thoroughly understands the manufacture and distribution of gas, setting retorts, fixing interior fittings, laying mains and services, repairing meters, keeping and collecting accounts. Can give good references.

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TO GOOD GAS-FITTERS.

WANTED, a thoroughly respectable, intelligent, first-class GAS-FITTER to undertake the making of gas for a nobleman's mansion, and to do the necessary gas-fitting as it is required. Married, without family, preferred, but not indispensable.

Address Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WICKHAM MARKET GAS COMPANY, LIMITED.

THE Directors of the Wickham Market Gas Company invite TENDERS for the Erection of GAS-WORKS, Laying Mains, &c.

Plans and specifications may be seen at the Registered Office of the Company, at the Office of Mr. C. H. Read, of Wickham Market.

Tenders to be sent in on or before the 7th of September proximo, but the Directors do not bind themselves to accept the lowest or any tender.

By order,
C. H. READ, Secretary.

TO IRONFOUNDERS & OTHERS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company wish to receive TENDERS for the supply of about 8000 yards of SOCKET PIPE, 8 in., 6 in., and 4 in., with the necessary bends, syphons, &c.

Particulars on application at the Office, 56, High Street, Rochester.

WILLIAM SYMS, Secretary.
Aug. 30, 1867.

METER ON SALE.

THE Directors of the Accrington Gas and Water Works Company have FOR SALE a circular cast-iron cased STATION-METER for measuring gas. The inlet and outlet pipes are 8-in. diameter, and it is fitted up with all modern appliances.

Apply to ROBERT IDDON, Secretary.
Accrington, Aug. 8, 1867.

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A FIRM of Accountants, much engaged in the preparation of Gas Companies Accounts, are open to contract for the keeping, balancing, or auditing the books of other Companies, which, from their experience, they are enabled to do on moderate terms.

Address, SANDELL & MADDERS, Accountants, 4, Skinner's Place, Size Lane, LONDON, E.C.

GAS and Water Pipes, Girders, Columns, Retorts, and General Castings, quoted for on application to GEO. BOWER, Milton Iron-Works, WEST HARTLEPOOL.

N.B.—A large stock of 2 to 8 in. pipes usually ready for immediate delivery.

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NOTICE is hereby given that the HALF-YEARLY ORDINARY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Bridge House Hotel, London Bridge, Southwark, on THURSDAY, the 10th day of October next, at Three o'clock in the afternoon precisely, to receive the Directors Report for the half year ending the 30th of June last, and to declare a Dividend.

The Books for the Transfer of Shares will be closed on Saturday, the 28th of September, until after the Meeting.

W. P. BODDY, Secretary.
Rotherhithe, Sept. 1, 1867.

STEARS BROTHERS & CO.,
Gas Engineers and Contractors,
3, GEORGE STREET, HULL,
AND
73, COLEMAN STREET, LONDON, E.C.

Contractors for Gas-Works of any size at home or abroad. Copy of testimonials from numerous Gas Companies can be had on application.

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FOR SALE.—A Good Cast-Iron Tank, in excellent condition, 45 feet diameter, 14 feet deep, either with or without Gasholder.

Also the following STATION-METERS:—

One to pass	12,000	cubic feet	per hour.
One "	8,000	"	"
One "	4,000	"	"
Two "	3,000	"	"

The whole have been taken apart, thoroughly examined, and are in good working order, equal to new.

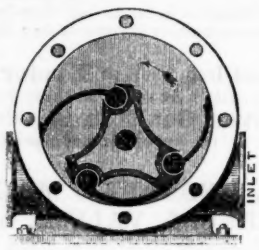
The above have been taken down to make room for larger.

Apply to JOHN VICKARY, Gas Engineering Works, EXETER.

PIRNIE OR METHILL CANNEL.

ONE of the best Gas Producing CANNELS for bringing up the quality of ordinary coal gas. See Dr. Frankland's Lecture, reported in the JOURNAL OF GAS LIGHTING, 30th of April last.

For price apply to PIRNIE COAL COMPANY, Leven, FIFE.



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Also,
ROTARY TAR, OIL, AND LIQUOR PUMPS.
For particulars and prices apply to the Patentee,
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ESTABLISHED 1840.
JOHN EUNSON AND SON,
GAS ENGINEERS, AND MANUFACTURERS OF CLAY RETORTS,
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WOLVERHAMPTON.
Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

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A great saving of time, labour, and expense is effected by the use of
PRICE'S
PATENT COAL AND COKE BARROWS.

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Manufacturers for London and South of England—PRIEST & WOOLNOUGH, KINGSTON-ON-THAMES.

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(ESTABLISHED 1827,)

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1867.

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Manufacturers of

STATION METERS for GAS-WORKS, CONSUMERS METERS, GOVERNORS,

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N.B.—The flanges of the plates for the Square Station-Meters are planed so as to ensure perfect joints—guaranteed not to leak.

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Are Durable, Economical, and keep their Colour.

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"The Journal of the Society of Arts," June 1, 1866.
"The Mechanics' Magazine," October 26, 1866.
"The Engineer," November 2, 1866.
"The Building News," November 9, 1866, &c.

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GATES, RAILINGS, VERANDAHS,

Balcony Panels, Stable Fittings, Columns, &c., &c.,

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Contractors for the supply of Lamp Columns, Lamps, &c., to Railway and Gas Companies, Local Boards, &c.

PIPES, TUBES, & FITTINGS FOR GAS, STEAM, & WATER.

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Gas-Meter, Gas Apparatus, and Gasfittings Manufacturers,

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NEWGATE STREET, LONDON.

Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gasfittings and Gas Apparatus.

MARTIN'S

LEE MOOR PORCELAIN FIRE-BRICKS,

Containing no Lime, and only ·45 of Oxides, resist the strongest heats, and will last for Gas-Works longer than any others.

Samples and prices sent, and the highest references given, on application to

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MANUFACTURERS OF GASHOLDERS, TANKS, PURIFIERS,

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Iron Roofs, and General ron Work. Mains Supplied and Laid.

S. C. & Son supply every requirement for a Gas-Work, and keep in stock Retort Lids, Costers, Barrows, Scoops, Bolts and Nuts, &c. &c.

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Manufacturers of all kinds of

GAS AND WATER PIPES,

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RAILWAY CHAIRS & SLEEPERS,

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EIGHTEEN YEARS PRACTICAL EXPERIENCE.

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Fire-Clay and Iron Retorts, Double and Single Grooved Brick Retorts, of every description.

Bentley's Improved D Brick Segment Retorts, 5 or 3 in one bed.

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A. C. FRASER, Gas Engineer, Inventor and Patentee of the RIBBED CAST-IRON RETORTS, and RIBBED and GROOVED CLAY RETORTS, which are in use at the Gas-Works, Derby, Shrewsbury, Portsmouth, Nottingham, Colchester, Seaham, Reigate, Whittlesea, Baldock, Syston, Rugby, Barrow-in-Furness, Ripley, Royston, Leighton Buzzard, Risboro', Woking, Loughboro', Kegworth, Donnington, Honiton, Crewkerne, Canterbury, Wincanton, Swadlincote, &c.; Llandudo and Corwen, N.W.; Stornoway, N.B.; Carlow, Longford, Queenstown, and Castlederg in Ireland. They are also extensively used by Proprietors and Lessees of Gas-Works, at several Government Gas-Works, and abroad at Cape of Good Hope, Montreal, Gibraltar, Holland, and Mexico.

For prices, &c., apply to A. C. FRASER, Gas Engineer, COLCHESTER.

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PATENT APPARATUS

FOR

CHARGING & DRAWING GAS-RETORTS,

AND FOR

CLOSING THE MOUTHS OF RETORTS

WITHOUT CEMENT.

The above is one of the most important inventions in connexion with gas manufacture which has been introduced for many years, and merits the immediate attention of all Gas Companies. The Machine is simple in its construction, easily worked, and not likely to get out of order, while the saving in time and labour is very considerable. It has been applied at the Chartered Gas-Works, Westminster, with complete success, and has been viewed in operation by some of the most eminent gas engineers, both in London and from the provinces, their unanimous opinion being that the arrangement of the apparatus was perfectly new, and must eventually be adopted by all Gas Companies.

The Patentees are now in a position to treat for the use of their Apparatus.

For further information apply to

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CAST-IRON Retorts, Socket Pipes, with Syphons and all requisite Connexions, Lamp Columns, Wrought Iron Tubing, Valves, Street Lamps, Sight Holes, Furnace Doors, Ash Pans, Charging and Coke Shovels, Iron Pails and Coke Barrows, Cross Bars, Fire Pots, Pumps, Iron Borings.

PURIFIERS, CONDENSERS, and SCRUBBERS erected complete, or the materials supplied; with every description of goods in use by Gas-Works, in stock, on wholesale prices, at

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AUCHINHEATH, Lesmahago, Gas COAL, known in the market for the last fifty years as a first-class gas coal.

JAMES FERGUSON and CO.,

Sole Lessees of the Auchinheath Coal-Field, are prepared to ship the above at Glasgow, Greenock, and Ardrossan, on the west coast of Scotland; and at Granton or Leith, in the Firth of Forth, on the east coast. Also to forward them to any railway-station in Scotland or England.

Price and other particulars may be learned by addressing

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THE BRITISH IRON TUBE COMPANY,

MANUFACTURERS OF

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SCREWING TACKLE, CORE BARS,

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SILVER MEDAL, INTERNATIONAL EXHIBITION, PARIS, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS,

PLAIN, GALVANIZED, & ENAMELLED, for Gas, Steam, and Water, from ⅛ in. to 6 in. bore.

STOCKS, TAPS, and DIES, GUN METAL GLAND-COCKS, WATER-GAUGES, &c.

PATENT LAP-WELDED IRON TUBES

For Locomotive and Marine Boilers, &c.

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1862.

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MADE ONLY BY

GEORGE HALLETT & CO.,

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CLASS II.

This Paint having been in general use over four years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (28s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs under 20s. per cwt., as compared with White Lead at 28s. per cwt.

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SELF-ACTING DISTRICT GOVERNOR.

Prices, according to size, can be obtained upon application to

Mr. WILLIAM ARCHER,

METER COMPANY'S WORKS, OLDHAM.

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INVENTOR OF THE FIRST SUCCESSFUL

DRY GAS-METER.

210,000 IN USE.

WORKS:

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KIRKWOOD CANNEL COAL.
This Coal is largely used in the Gas-Works at Glasgow, Paisley, Port Glasgow, Edinburgh, Leith, and many other towns throughout Scotland. It yields 10,648 cubic feet per ton; illuminating power, 27·55 standard candles; coke per ton, 9 cwt. 83 lbs. Railway communication from the pits (at Coatbridge) to all parts of the country; ports of shipment in Firths of Forth or Clyde.
For quotations, &c., apply to Mr. JOHN MACDONALD, 68, St. Vincent Street, GLASGOW.

FIRE-CLAY GAS-RETORTS, &c., CANNEL AND STEAM COALS.
WILLIAM FRASER, Inverkeithing
(owner of the Works at which Fire-clay Retorts were first made), having greatly enlarged his works, can supply retorts and other fire-clay goods to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
WILLIAM FRASER ships COWDENBEATH PARROT COALS at Charlestown and Burntisland at 11s. per ton; and HALBEATH STEAM COALS, on Navy List, at 8s. 6d. per ton.

JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
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Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water-Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
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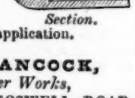
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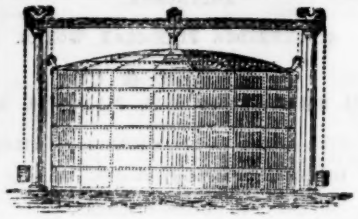

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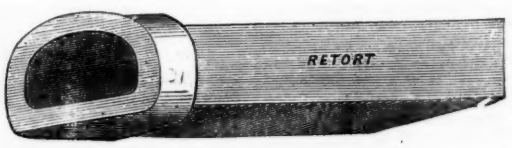

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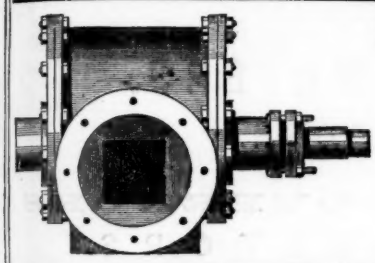

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